ANDERSON DAM
Landslides near
Abutments & Geologic
Reports

R-14

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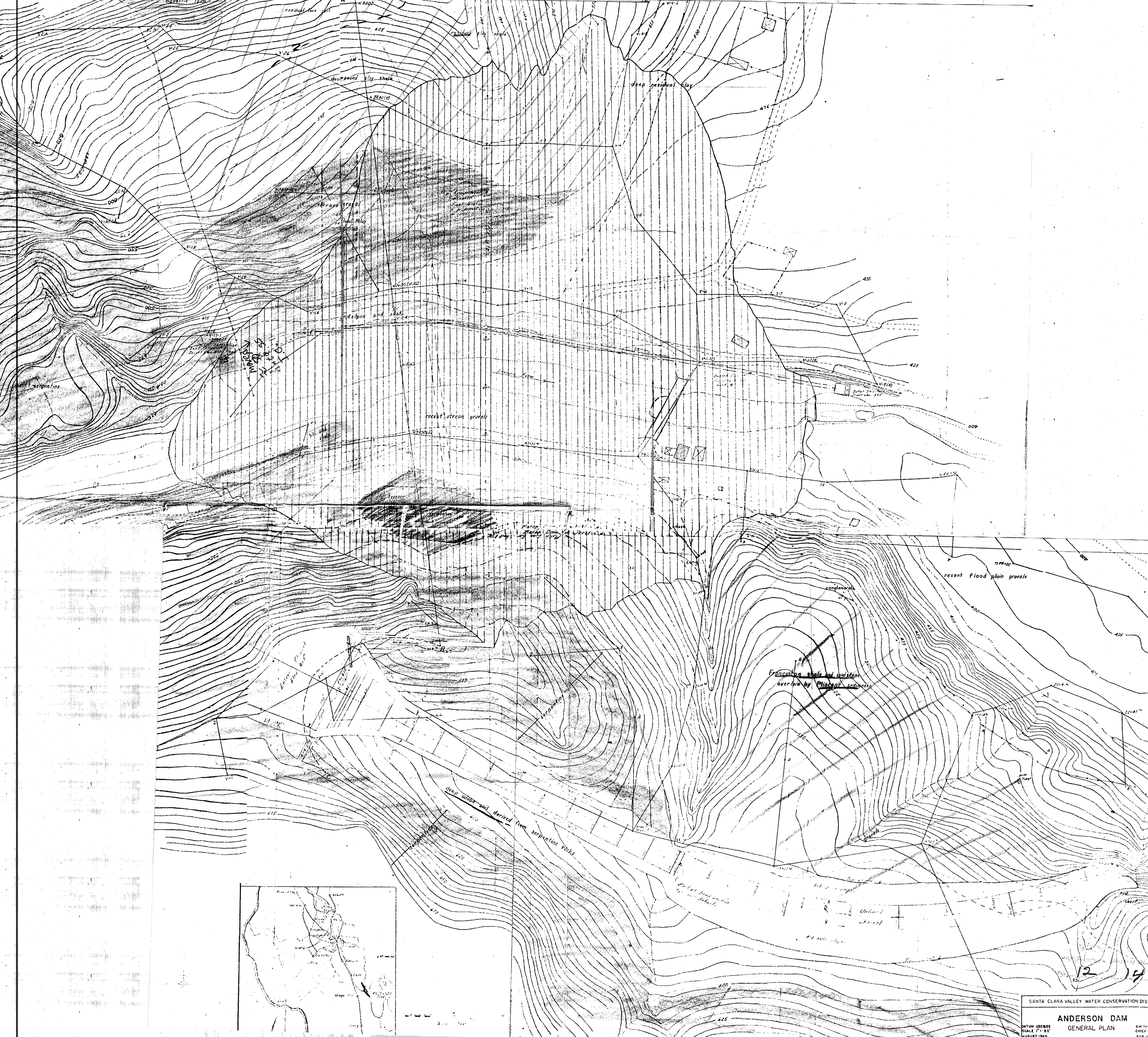
S383. A54
1973
C.1
Library

QE599 S383 A54 1973 c.1



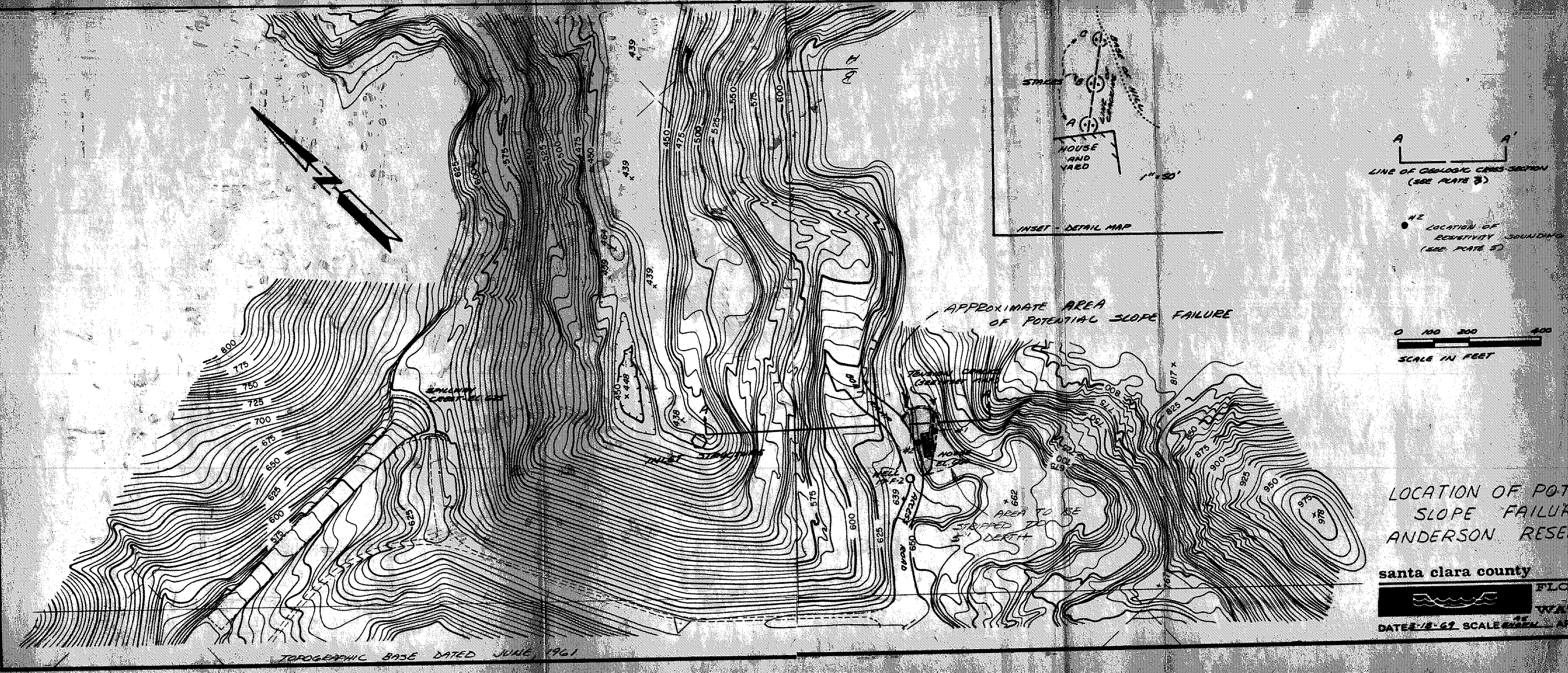
SANTA CLARA VALLEY WATER CONSERVATION DIS

ANDERSON DAM

GENERAL PLAN

DATUM USC&GS
SCALE 1" = 80'
AUGUST 1949

G.W. HU
CHIEF

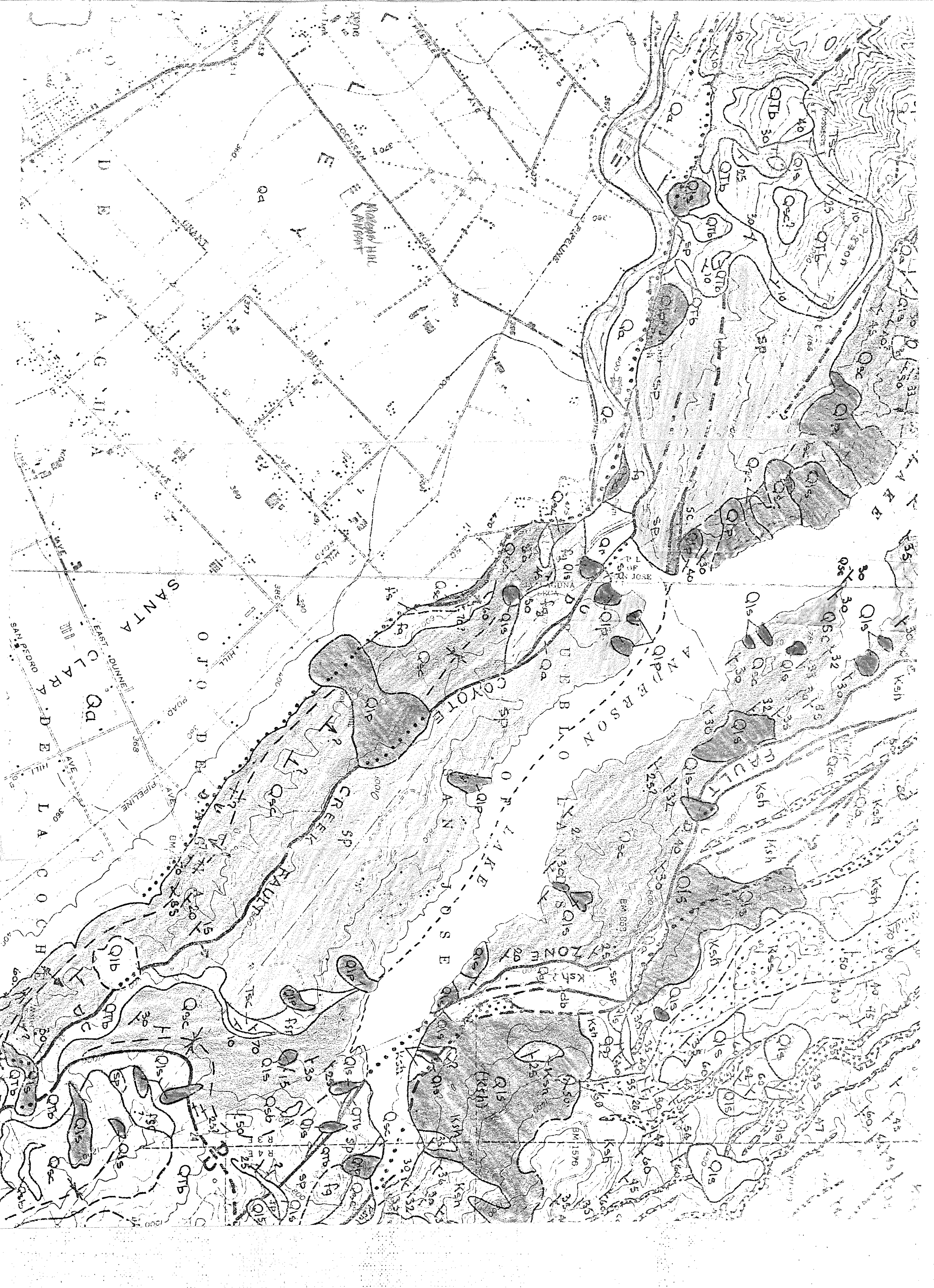


LOCATION OF POTENTIAL
SLOPE FAILURE
ANDERSON RESERVOIR

santa clara county
FLOOD CONTROL
and
WATER DISTRICT
DATE 3-18-69 SCALE AS SHOWN APPROVED ____

PLATE 1

copies of Geologic Maps
Marliave's
Dibblie's


SANTA CLARA
OJO DE LA COCHE
ANDERSON LAKE
COYOTE CREEK FAULT
PUEBLO SAN JOSE
ZONE
EAST DUNNE AVE
HILL ROAD
PIPELINE
SAN PEDRO
COCHRAN ROAD
MAIN AVE
Qa
Qls
Qlp
Qsc
QTb
Ksh
Tsc
SP
fg

Dr Louderback

recommended
measures to
stabalize "intake
tower" slide.

Not in
order
yet

REQUEST FOR SURVEY

DIVISION: Resources Management

DATE: March 2, 1973

PROJECT: Anderson Reservoir Landslide Study

TIME CARD CHARGE NOS: 190116

TYPE SURVEY:

TRANSIT BOOK:

DATE DESIRED: March 5 - 9

LEVEL BOOK:

SUBDIVISION MAPS, File No:

RECORDS OF SURVEY, File No:

CONSTRUCTION PLANS, File No:

DETAILED INSTRUCTIONS:

Resurvey monuments installed in landslide area on the east side of reservoir adjacent to Cochrane Bridge and to resurvey the top of the slope indicators installed on the left abutment area of Anderson Dam.

Sent
3-5-73

5770

REQUESTED BY Gene Watson

T. Iwamura

memorandum

TO Jack Watkins, Jr.	FROM	Jim Vantine
SUBJECT Results of Monitoring and Geologic Findings of the Landslide Area on the Left Abutment of Anderson Dam		DATE April 26, 1973

This memorandum is to document recent geologic findings and other previously unrecorded geologic information of the landslide area located on the left abutment of Anderson Dam. The landslide area has been of considerable concern to the District since completion of the dam and reservoir. Movement of a small portion of the area occurred in 1962 severely damaging buildings and other structures including the boat-launching ramp. In 1969, renewed movement upslope of that in 1962 necessitated moving an additional building. The landslide area is especially important since the intake structure for the dam is located immediately downslope and since the Santa Clara County Department of Parks and Recreation's boat-launching ramp crosses the landslide area. Recent proposals have been made by both the County and private developers to expand the boat launching facilities and to build other structures which may affect the stability of the area.

The landslide area was found by recent field mapping to be mostly a large complex and ancient landslide which has both recently reactivated and inactive portions. For the purposes of this memorandum, the reactivated portions are referred to as Landslide "A", and Active Landslide Area "B".

Geologic Conditions

The central portion of the ancient landslide area is underlain by the Post Pliocene to Pleistocene Coyote Creek fault which is steeply dipping and which has a northwest-southeast orientation. The fault underlies the upstream toe of the embankment and the right abutment of the dam. The fault separates Franciscan and Packwood formation rocks which occur on the southwest side of the fault from intrusive serpentine which occurs on the northeast side of the fault. In the upper left abutment area above elevation 650 feet, Franciscan Formation greenstone occurs on the southwestern side of the fault. Underlying the greenstone, at a level slightly below the parking lot, is Franciscan Formation shale and graywacke containing slivers of serpentine and upon which most of the embankment is founded. Intense fracturing and moderate shearing occurs within the greenstone where it lies adjacent to the fault. On the northeast side of the fault, the serpentine is generally highly crushed and sheared and is very similar in appearance to landslide debris and therefore difficult to determine if in-place. Most of the serpentine consists of a soft to moderately soft matrix with inclusions of hard semi-rounded to angular blocks of peridotite, silica-carbonate or other ultramafic rocks.

Extent of Ancient Landslide Deposits

The geologic mapping revealed that a considerable area on the left abutment is underlain by what appears to be ancient landslide deposits. The general boundary of these deposits is shown on the attached Figure 1.

A small portion of the west boundary of the ancient landslide mass was reasonably well established in a road cut leading to the adjacent Rosendin property. At the east edge of the parking area the large greenstone outcrop referred to above is intensely fractured and cut by thin shear zones containing clay gouge. Slickensided surfaces occur along several of these thin shears which are steeply dipping and which indicate movement between adjacent rock surfaces. The slickensides occur in the easternmost portion of the greenstone body. They are generally due to fault movement but in this area appear to indicate both fault and landslide movement and probably marks the westernmost boundary of the ancient landslide mass. Upslope of this presumed landslide boundary is the edge of an amphitheatre-like area which is characteristic of the main scarp and crown area of a landslide. Downslope of this same area is the westernmost edge of the two recent slope failures which occurred in 1962 and 1969 (See Figure 1).

The eastern edge of the ancient landslide deposits was only partly determined. The boundary is somewhat east of the active Landslide "A". Older landslide debris is exposed in the eastern side scarp of Landslide "A".

The upper boundary of the ancient landslide mass is at about elevation 800 feet and near the crest of the ridge. The toe of the landslide extends, in places, to the bottom of the canyon, and is inundated by the reservoir. During exploration for the dam, terrace deposits and in-place Franciscan sedimentary rock were reported in the lower portion of the slope above the upstream toe of the dam and landslide debris was indicated as occurring upstream of the toe of the dam.

In the central portion of the ancient landslide mass a more competent body of serpentine is exposed which lies midway between the two active landslide areas. This body is similar in character to more competent masses that are known to be portions of active Landslide "A". Although this mass appears to be in-place, it may possibly represent a more competent mass within the inactive portion of the ancient landslide.

The width of the ancient landslide is more than 1,000 feet at the toe and about 650 feet at the head of the slide. The length of the slide is about 1,000 feet in the eastern portion and about 900 feet in the western portion. Depth of the slide mass is probably variable, with generally shallower depths probably occurring in the upper and middle portions. The maximum depth may be as great as 100 feet.

The age of the landslide is probably several hundreds or possibly thousands of years. It is suspected that since the initial movement, periodic movement has occurred involving only portions of the entire landslide mass. It is probable that the landslide was triggered by a moderately large earthquake on the Calaveras fault system which includes the Coyote Creek fault.

Active Landslide "A"

This active landslide is part of the large, ancient landslide mass briefly described above. It lies mostly above the terminal end of the boat-launching ramp and probably extends below the boat-launching ramp to the bottom of the reservoir. It has a length of 950 feet and an average width of 350 feet.

The boundaries of the landslide are well defined above the reservoir level. A steep main scarp, which was estimated to be more than 40 feet in depth, occurs along the upper west boundary of the main scarp. Scarps along both flanks of the landslide are also well defined in the upper and middle portions and are as much as 25 feet in depth. Some brush and small tree growth occurs in these scarps.

Depth of the slide mass, as determined from the recently installed slope indicator, is at least as great as 50 feet, with an estimated maximum depth of 75 feet (See Figures 3 and 4). The average depth is estimated to be about 50 feet. Assuming an average depth of 50 feet, the volume of material within the active landslide is approximately 600,000 cubic yards.

The material comprising the landslide debris is almost entirely derived from serpentine. Most of the serpentine debris is clay and small rock sized fragments with many hard, semi-rounded blocks up to several feet in diameter.

Movement Prior to 1950 - In 1950, just prior to construction of the dam, the landslide was apparently similar in appearance to that of today. In the geologic report dated September 15, 1949, for Anderson Dam by the District's consultant, Mr. Chester Marliave, it was stated that near the upstream toe of the dam:

> "there is a 65-foot width of hard serpentine rock beyond which the formation is all soft, weathered serpentine as far as the upper end of the gorge."

This latter area referred to in the report is the toe of Landslide "A". It was also mainly due to the presence of this landslide that Mr. Marliave recommended the present dam axis, instead of the originally considered axis 2,000 feet upstream.

Another consultant's report also mentions this landslide.

Dr. George D. Louderback, in a letter dated June 5, 1950, stated:

> "In the past a large slide has occurred in the left canyon slope not far above the dam site. It is terminated upward by a striking cliff, which is at an elevation well above the top of the dam. The mass of serpentine that moved down the slope undoubtedly stopped in a condition of stability under the conditions then prevailing. Whether the sliding action was brought about as a result of a heavy rainy season or was precipitated, possibly in a normal season, by a strong earthquake is not known. Future slumping from the steep cliff would dump material on the upper end of the slide with little chance of its directly reaching the reservoir. The present slide mass, if it did not come to rest under saturated conditions, may if its lower part becomes saturated with reservoir water, lose its stability and move down toward the canyon floor. A slide entering the reservoir will disturb the water surface. One coming from a new and steeper slope should produce larger waves than one occurring in the old slide mass. . . . There may be other slopes subject to sliding besides the one described."

The time that the landslide initially occurred can only be crudely estimated. Tree growth within the main scarp and the freshness of the scarp indicate the initial movement was sometime during this century, possibly during the 1930's or early 1940's.

Movement Between 1950 and 1972 -- After construction of the dam and the initial filling of the reservoir, slow movement occurred. Evidence for this movement is that a road located slightly above the high-water line and apparently constructed during or immediately after completion of the reservoir has been destroyed. Air photos taken in 1960 reveal that the road was mostly obliterated by that time and more recent 1972 photos show that almost the entire length of the road was obliterated.

Other evidence exists of the landslide having slow and/or periodic movement during this period. Photographs taken of the left abutment in 1962 show cracking on the west flank of the slide which is barely discernible at the present time. Movement in the form of sloughing at the main scarp also occurred early in this period where a road, presumably constructed above the slide and during construction of the dam, partially failed.

The total amount of movement during this period is in the order of several feet.

Movement During Winter of 1972-73 - Last spring, a monitoring program was initiated to gather information on the landslide problems of the left abutment area. A 75-foot deep slope indicator, SI-1A, was installed in Landslide "A" to accurately measure the amount and depth of movement. In addition to the installation of the slope indicator, the top of the slope indicator was surveyed from control points across the reservoir to detect movement and to determine if possible movement was occurring below the bottom of the slope indicator - movement that would not show on the slope indicator reading.

The results of the slope indicator readings are shown in the attached Figures 2 and 3. The readings are for the dates of

October 6, 1972, November 17, 1972, January 25, 1973, and March 14, 1973. It can be seen that the large majority of the movement has occurred between the depths of 46 to 50 feet in a northerly (downslope) direction (not true north). Below this depth no movement, or only possible slight movement, has occurred. Above this depth zone some additional movement has occurred. About one inch of movement occurred between the November 17 and January 25 measurements, while seven inches of movement occurred between the January 25 and March 14 measurements.

The results of two surface surveys of the top of the slope indicator are presented in Figure 4. Between December 27 and March 16, a total of 0.52 feet of downslope movement was recorded, which is less, but comparable to that recorded by the slope indicator during a similar time period. The survey indicates that the lowermost failure plane is at the 50-foot depth zone. The last measurement was on April 10, which showed a movement of 0.18 feet between March 16 and April 10.

Observations of the ground surface also revealed evidence of movement during the past winter. Fresh cracks and small scarps were found along almost the entire boundary of the landslide mass. On the west boundary a 3 to 4-inch scarp occurs across the construction road built last spring to install the slope indicator.

Almost continuous cracks, with a horizontal separation of 1 to 3 inches, occur at the base of the main scarp along the contact with the slide mass.

Active Landslide Area "B"

Landslide Area "B" encompasses three recent landslides which appear from surface mapping to be reactivated portions of the large ancient landslide previously described (See Figure 1). The three landslides have occurred within the past 11 years. Landslide Area "B" is located above the left abutment of the dam about 200 feet upstream of the center line of the dam. The intake structure is located below this area at the upstream toe of the dam.

Movement in 1962 - The most damaging movement occurred over a 10-day period between March 7-17, 1962. The landslide was approximately 300 feet in length and 200 feet in width. Depth of the slide was estimated at a maximum of 50 feet for a maximum volume of 100,000 cubic yards. A small portion of the slide consisted of fill material used for the then recently constructed boat-launching ramp. The bulk of the landslide debris is suspected to have been material within the ancient landslide mass.

The main scarp of the landslide severely damaged an amusement stand, gas pump, storage tank, and the boat-launching ramp. It also endangered four buildings upslope, which were later removed. The main scarp showed lateral movement of 6 to 7 feet, with about the same amount of vertical movement. The toe of the slide was thought to have reached the groin of the dam at about an elevation of 525 feet downslope. About where the toe of the slide was thought to occur terrace deposits, now inundated, had been previously reported on in-place Franciscan Formation graywacke and shale. It is not known if these "terrace deposits" were actually terrace deposits or slide debris derived from adjacent ? outcrops of similarly appearing Packwood Formation sediments.

Movement in 1969 - On February 28, 1969, tension cracks were discovered in the caretaker's driveway about 100 feet upslope of the main scarp of the landslide that occurred during March of 1962. The cracks gradually increased in length and width at a rate of .01 feet per day until about March 17 when movement apparently ceased. A detailed investigation was made of the failure to determine if a large landslide was developing. As a result of the investigation, the caretaker's home, which was affected by the failure, was relocated. A resistivity survey was made for the investigation which indicated that the material overlying bedrock and which is probably ancient landslide debris, was up to 40 feet in depth.

A well located slightly upslope of the scarp of the slide in 1962 and approximately 100 feet downslope of the cracks at the caretaker's home in 1969 indicated serpentine and shale bedrock at a depth of 60 feet. The well log also indicates the existence of 5 feet of fill underlain by 55 feet of what is either in-place Packwood Formation sediments or ancient landslide debris. The bedrock was logged as being mostly shale, with considerable lenses of serpentine. During the drilling of the well, groundwater was encountered at 40 feet, which rose to a depth below the ground surface to 25 feet, indicating confined groundwater conditions. It is suspected that the recharge area for the groundwater supplying the well is the intensely fractured greenstone which occurs upslope.

During the recent field investigation, additional scarps and signs of failure, which were not mentioned in the report on the movement during 1969, were observed. The small scarps appear to be a few years in age and may have occurred during the failure reported in 1969. The uppermost scarp is about 2 feet deep and 8 to 12 inches wide. The scarps are vertical for at least 4 feet beneath the ground surface with no indication at that depth of the typical downslope curving generally occurring at the head scarps. The uppermost scarp is located 50 feet to the east and southeast of the slope indicator which was installed in this slide area. A parallel semi-circular scarp occurs 12 feet downslope from the uppermost scarp and is about two feet deep. Several wide cracks occur below this scarp.

Movement in 1972-73 - During the past winter a shallow landslide occurred in a brush covered area which is immediately upslope of the boat-launching ramp and slightly east of the area affected by the landslides of 1962 and 1969 (See Figure 1). The slide is located downslope and to the east of slope indicator SI-2. The head of the slide occurs between 5 to 10 feet downslope of the road the slope indicator is located on. Width of the upper middle portion of the slide was measured at 47 feet, with a maximum estimated width of 60 feet. The length of the slide is about 80 feet. Scarps along the flanks of the slide were between 3 and 4 feet in depth, with the main scarp being about the same in depth. Several scarps occur in the middle portion of the slide mass, which are up to 2½ feet deep.

Horizontal movement appears to have been several feet at the toe where the maximum horizontal movement appears to have occurred. Depth of slide mass was estimated at a minimum of 15 feet and a maximum of 25 feet.

Results of Monitoring During Winter 1972-73 - Slope indicator SI-2 was installed a few feet upslope and slightly to the west of the slide that occurred last winter; 50 feet northwest downslope of scarps which appeared to be two to four years old; and slightly upslope of the failure cracks which occurred during March of 1969. The slope indicator was constructed during April of 1972. Readings were made on October 6, 1972, November 17, 1972, January 25, 1973, and March 14, 1973, and are presented in Figures 5 and 6. The movement since the installation of the slope indicator shows about one inch of downslope movement which is confined to the upper 12 feet. Almost all the movement occurred between November and March. Since the movement is slight, a longer time period will be needed to determine if a deeper active slide plane exists.

In addition to the monitoring by using the slope indicator, the top of the slope indicator was also surveyed on December 27, 1972, March 16, and April 10, 1973 (See Figure 4). During the period between December 27 and April 10, downslope movement of 0.07 feet was recorded.

Conclusions

1) A large complex ancient landslide occurs on the left abutment of Anderson Dam. The slide is in part due to weak rock found along the Coyote Creek fault which underlies a portion of the embankment.

2) Landslide "A" and Landslide Area "B" appear to be reactivated portions of the ancient landslide.

3) Landslide "A" was active prior to completion of the dam and reservoir. The effects of the reservoir and construction of the boat-launching ramp have probably been minor but contributing factors in the recent movement of the landslide.

4) Future movement of Landslide "A", based on past information, is expected to be slow and during the wet winter months. A small potential probably exists for rapid movement of the landslide. Such movement however could have serious consequences.

5) Landslide Area "B" consists of three relatively small landslides which have occurred since completion of the reservoir. The landslide area is a potential threat to the operation of the intake structure of the dam.

6) Future movement within Landslide Area "B" is expected to be relatively slow, although an unassessed potential occurs for rapid movement.

7) In addition to the active Landslides "A" and "B" other areas within the ancient landslide mass could be reactivated.

Recommendations

It is recommended that:

1) Continued monitoring of the landslide be performed by utilizing the slope indicators and surface surveys. It is anticipated that Slope Indicator SI-1A will be sheared off at about the 50-foot depth within the next rainy season. If this occurs, periodic surface surveys should be made of the top of the slope indicator.

2) Any proposed development on the left abutment area be carefully reviewed by the District to determine its effect on slope stability.

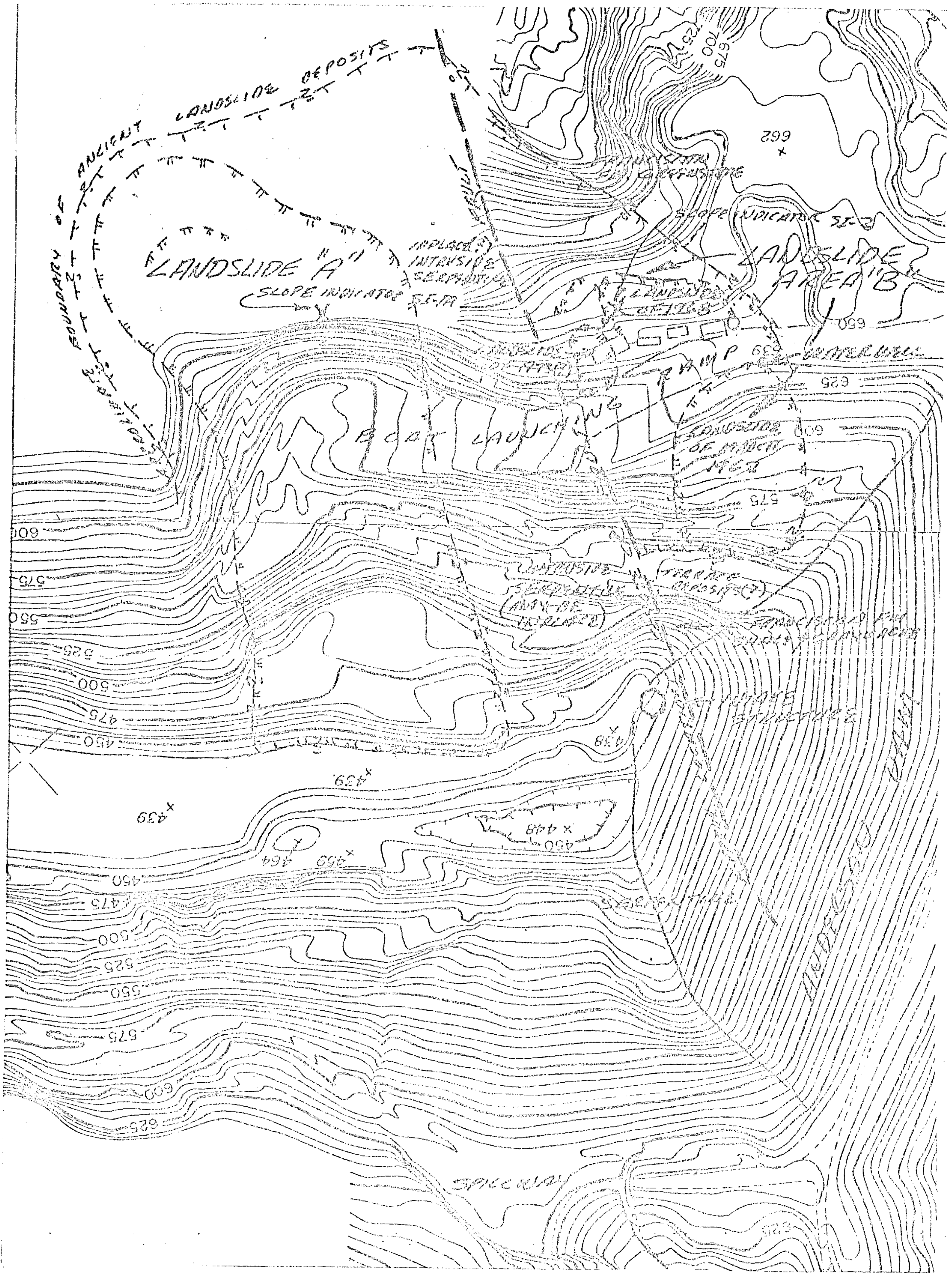
3) Additional study be made to determine what corrective measures are needed to stabilize the active landslide areas. Measures which should be considered for Landslide Area "B" are physical removal of the upper portion of the landslide and subsurface drains.

James V. Vantine

Engineering Geologist
Resources Management Division

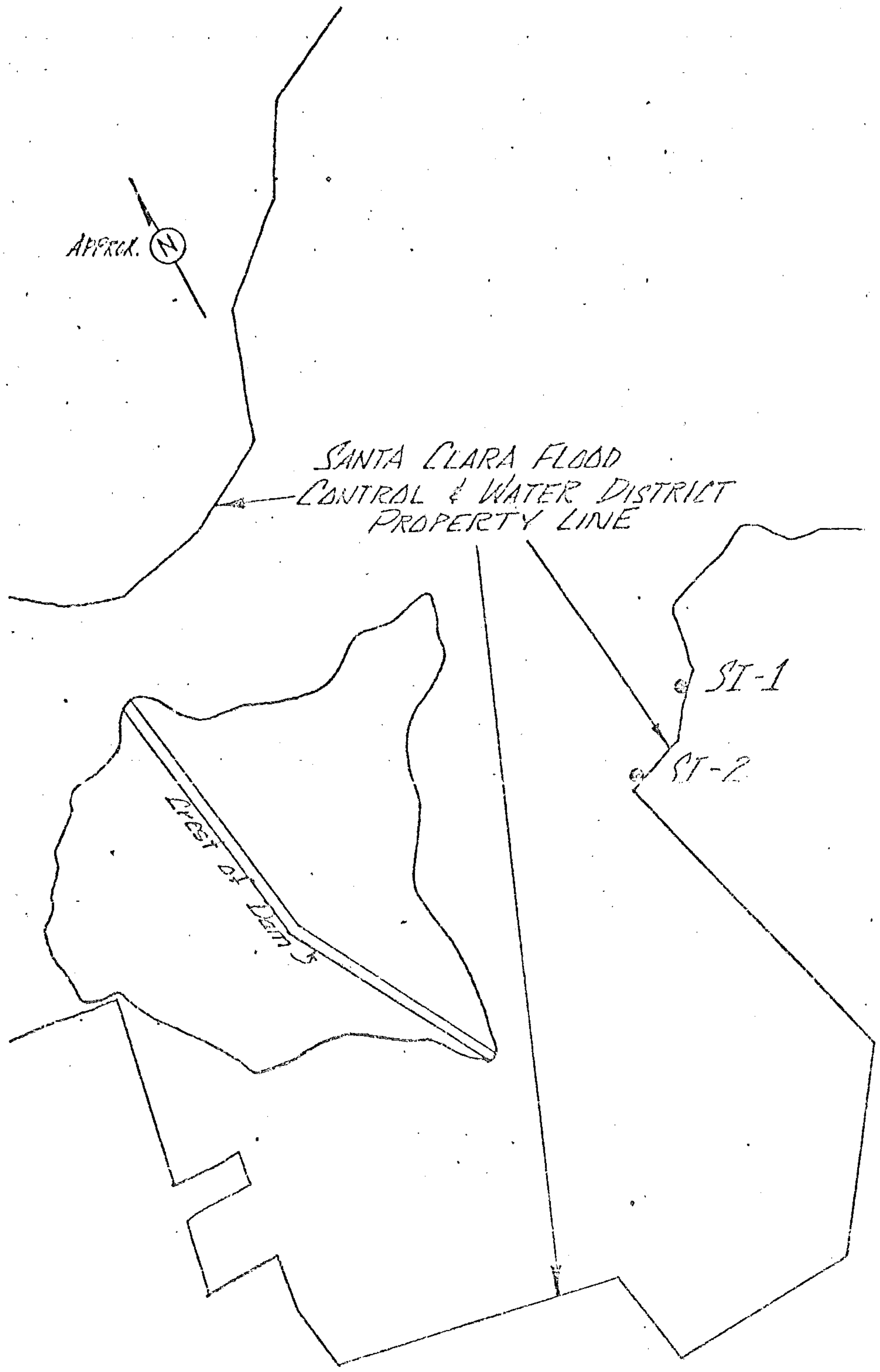
cc: Lloyd Fowler
Gene Watson
Dan Kriege
John Beaudet
Tom Iwamura
Bert Burger

FIGURE 1



SKETCH OF LANDSLIDE AREAS ON THE LEFT ABUTMENT OF ANDERSON DAM

FIGURE 2



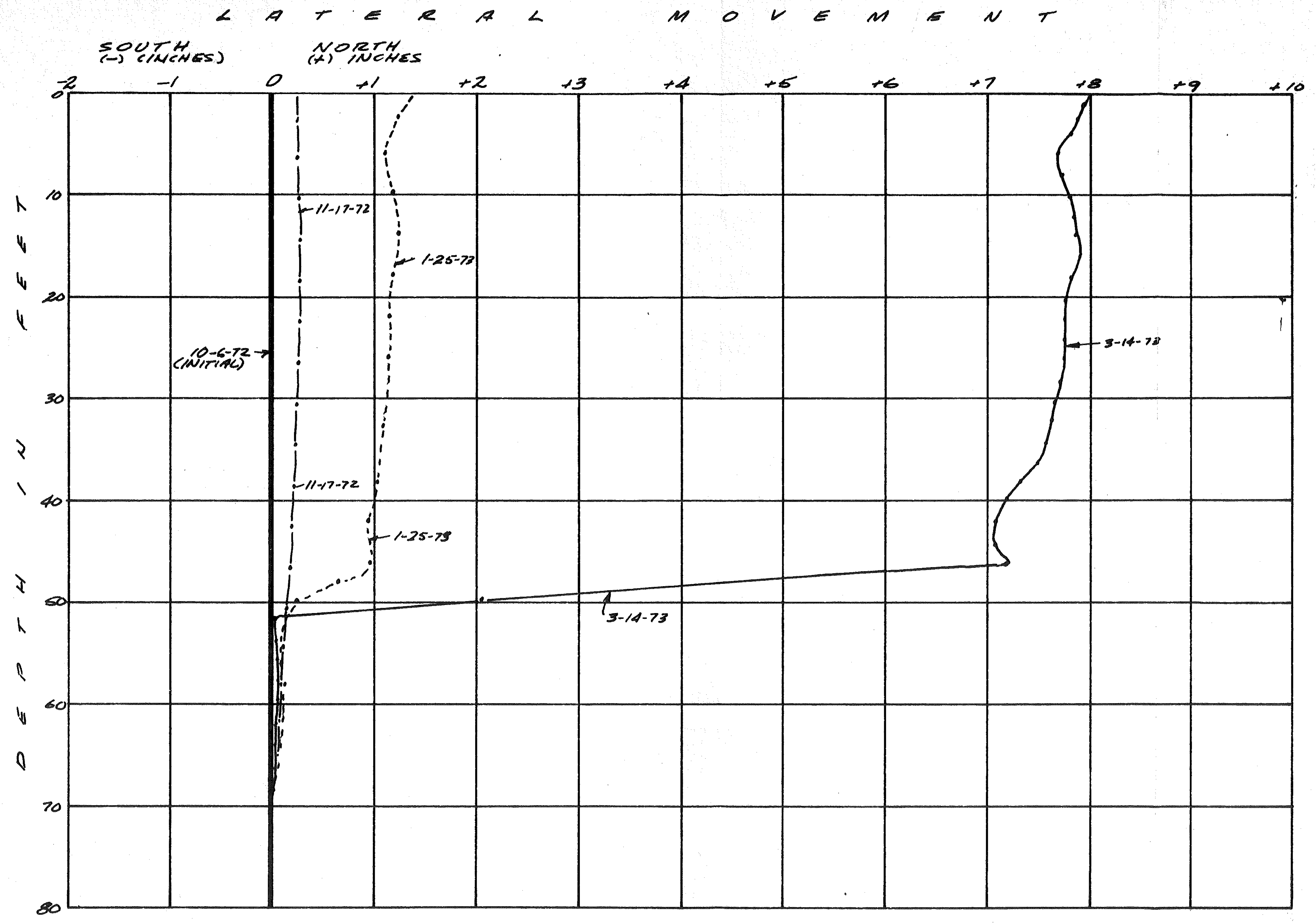
NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION

LOCATION SKETCH

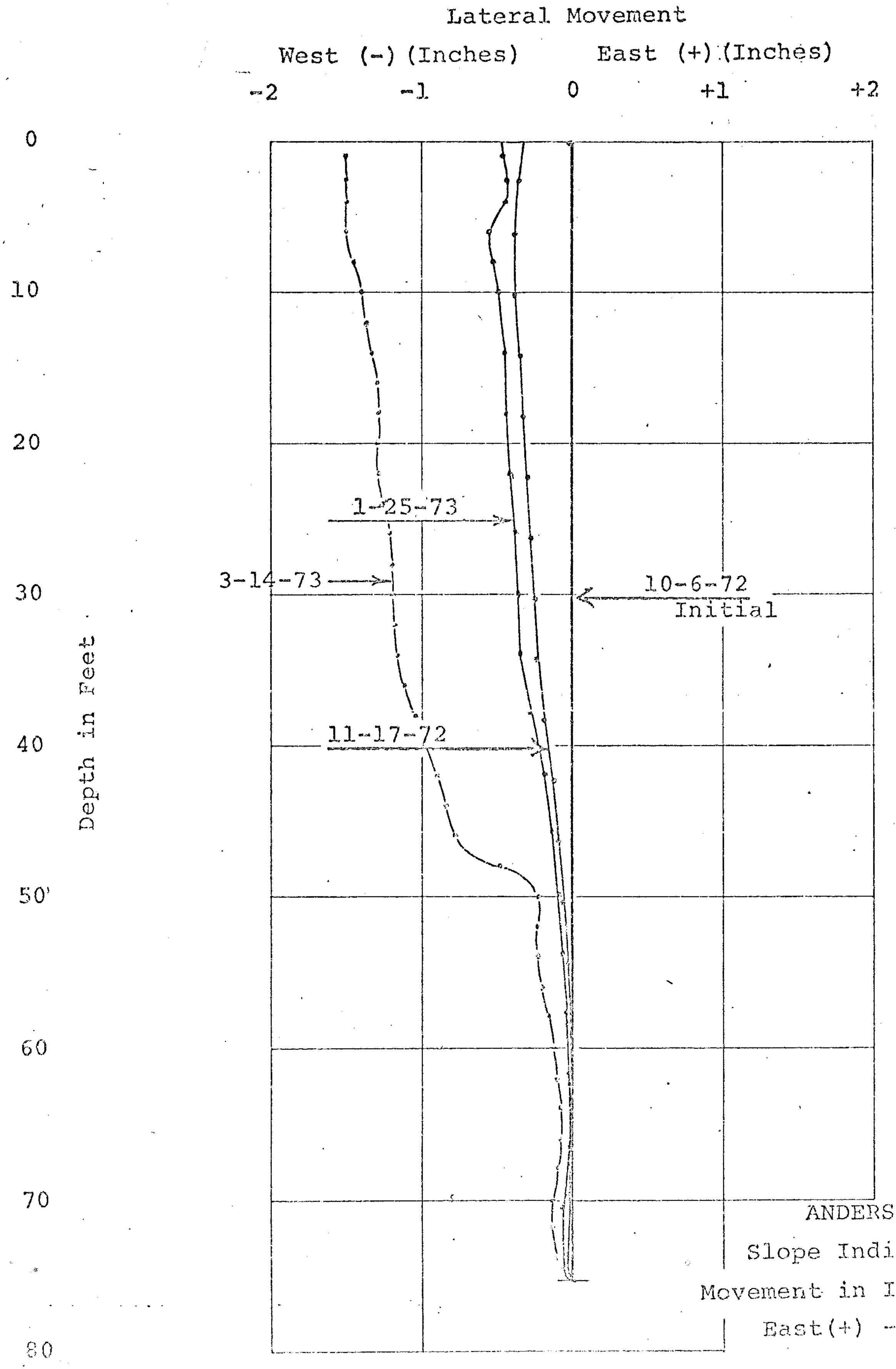
SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIGURE 3



SLOPE INDICATOR SI-1A

FIGURE 4



ANDERSON DAM

Slope Indicator SI-1A

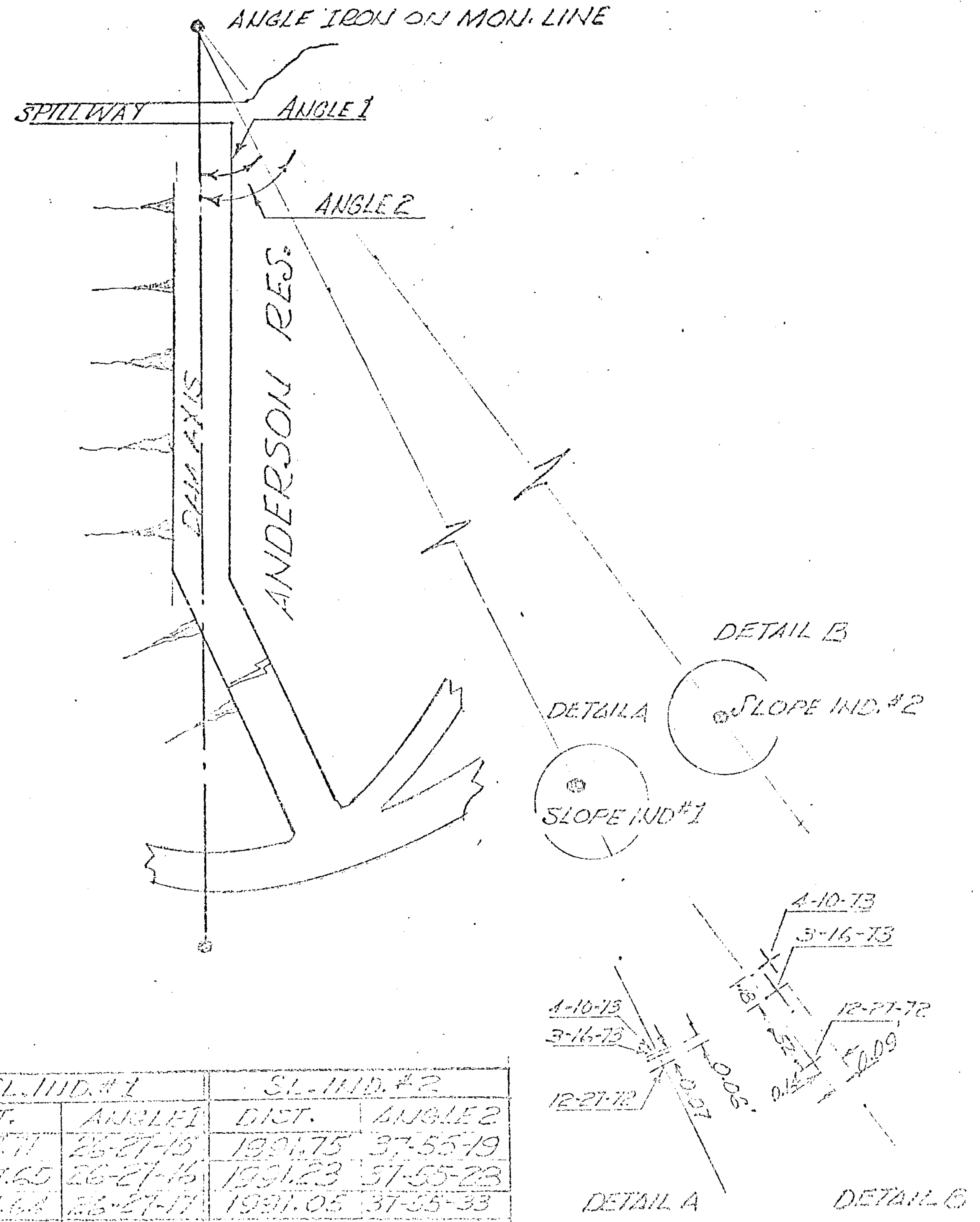
Movement in Inches vs Depth

East(+) - West(-)

P-1 SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT, San Jose, California

By________ Date________ Chkd. By________ Date________ Sheet No.____ of____

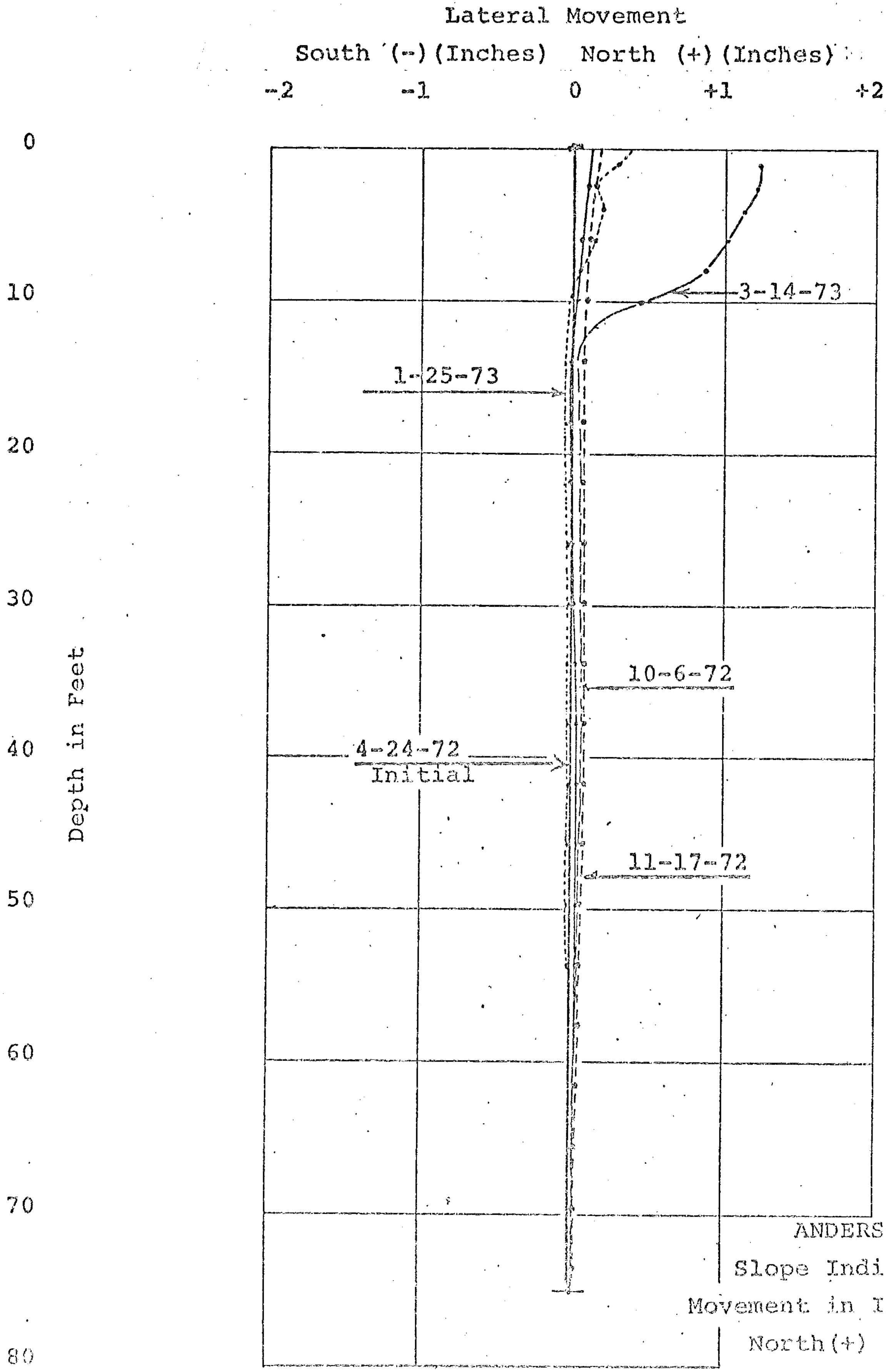
Subject MONITORING OF SLOPE INDIC. ANDERSON RES. Job No.________



	SL. IND. #1		SL. IND. #2	
	DIST.	ANGLE 1	DIST.	ANGLE 2
12-27-72	1897.71	26-27-15	1991.75	37-55-19
3-16-73	1897.65	26-27-16	1991.23	37-55-23
4-10-73	1897.68	26-27-17	1991.05	37-55-33

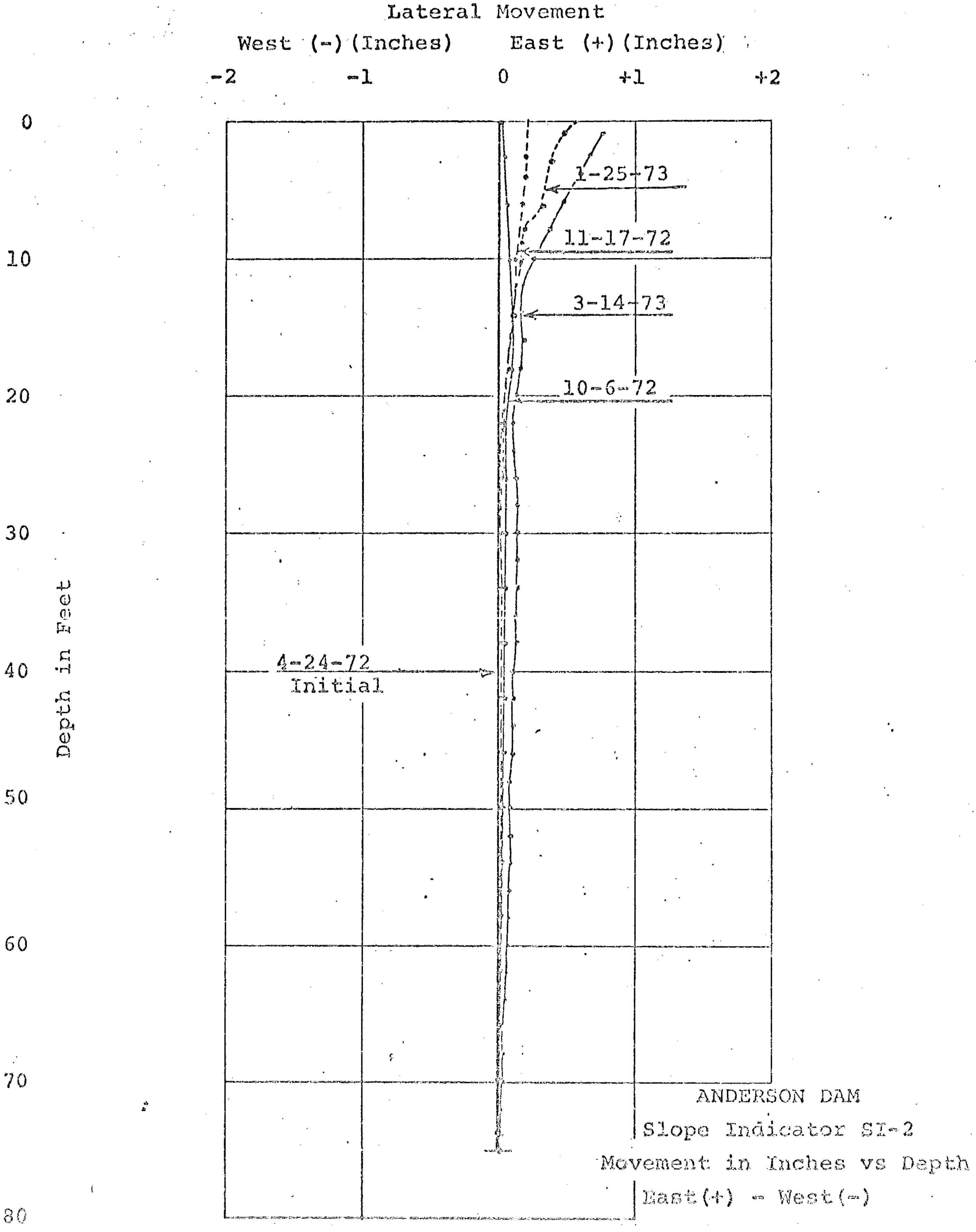
NOTE: DIST. SHOWN ARE SLOPE DIST.

FIGURE 6



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
North(+) - South(-)

FIGURE 7



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
East(+) - West(-)

GEOLOGICAL REPORT

ON

ANDERSON DAM SITE

LOCATED ACROSS COYOTE CREEK

IN

SANTA CLARA COUNTY, CALIFORNIA

BY

CHESTER MARLIAVE
CONSULTING GEOLOGIST
SEPT. 15, 1949

S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 1 OF 14

Property of :

Headquarters, Santa Clara Water Cons.
District
1520 Almaden Road
San Jose, Calif.

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Refered to on P. 6.

S. C. V. W. C. D.
MICROFILMED – JANUARY 1958
PG.________Of________

4

CHESTER MARLIAVE
CONSULTING GEOLOGIST
and
REGISTERED CIVIL ENGINEER
420 Boynton Avenue
Berkeley, California

GEOLOGICAL REPORT ON ANDERSON DAM SITE

LOCATION

The Anderson Dam Site lies across Coyote Creek at the mouth of the canyon where the stream breaks through the hills and debouches upon the eastern slope of the Santa Clara Valley. The site lies in Santa Clara County 2.7 miles north and 1.3 miles east of the town of Morgan Hill and only 6.3 miles downstream from the existing Coyote Dam which lies across the same stream.

The site is reached by turning off of Highway 101 on to the Cochran Road 1/2 mile south of the town of Madrone and then following alongthis paved road in an easterly direction for a distance of 2.7 miles. According to the government subdivisions the Anderson Dam Site would be found in the center of S.10-T.9S.-R.3E.-M.D.B.& M.

PROPOSAL

It is proposed to construct an earth dam at this site that would have a height of about 240 feet above streambed producing a maximum reservoir storage of about 75,000 acre feet. The reservoir thus created would completely control the runoff from the Coyote Creek watershed including the releases past the existing Coyote Dam. The impounded waters in Anderson Reservoir would be discharged into conduits or down the natural stream channel for irrigation and for replenishment of the underground storage in the Santa Clara Valley.

PHYSIOGRAPHY

The watershed tributary to the Anderson Dam Site lies along the western side of the Mt. Hamilton Range and the ground surface elevations range from a maximum of 4209 at the summit of Mt. Hamilton to 400 at the mouth of the canyon where the dam is to be constructed. A small thin capping of snow occasionally covers the higher slopes of the range but for the most part the rainfall runs off the surface immediately during the rainy season.

The canyon in which the Anderson Dam Site is located starts at the junction of Coyote and Las Animas Creeks and runs in a southwesterly direction for a distance of about seven tenths of a mile to a point just downstream from the concrete bridge where Coyote Creek is crossed by the Cochran Road. At this point the canyon emerges upon the floor of the Santa Clara Valley. From here on the stream channel follows along the base of the hills on the right side for about a half mile before it meanders out along the edge of the valley on its way toward South San Francisco Bay. This seven tenths of a mile of canyon has commonly been referred to as the Upper Coyote Gorge.

Can't [illegible] Hayward fault goes thru dam & reservoir

The outstanding feature of the terrain is the Haywards Fault System which traverses the area in a northwest southeast direction. This system continues southeasterly through the Coyote Dam Site and reservoir as a rather narrow zone approximately 1/3 of a mile wide and finally joins the San Andreas Fault System near the town of Tres Pinos some 60 miles distant. Midway between the Coyote Dam and the Anderson Dam Site the Haywards Fault Zone splits up and continues northwesterly toward the Carquines Straits as a number of widely separated faults. In the area under consideration the four branch faults are considered as being the Calaveras Fault, the Haywards Fault and their two west branches all of which are marked on the Vicinity Map.

The Anderson Reservoir Site occupies the valley that is travers by the westerly branch of the Haywards Fault. Coyote Creek flows northwesterly through a portion of the Anderson Reservoir Site and is joined by Las Animas Creek which flows southeasterly along the same general trough. Both of these stream courses have been determined by the West Branch of the Haywards Fault. At the confluence of the t streams Coyote Creek makes a right angle turn and runs southwesterly for a distance of about half a mile cutting through a rather high ridge and then emerges upon the floor of the Santa Clara Valley.

RESERVOIR SITE

As can be seen from the attached Vicinity Map the Anderson Reservoir would follow the general trend of the West Branch of the Haywards Fault. The length of the proposed reservoir would, about 6 1/2 miles with the two long lineal arms meeting near the middle of it and then continuing at right angles to the trough through the ridge toward the valley. The reservoir trough is comprised of Franciscan sediments an associated igneous rocks but it is partly filled with later deposits of poorly consolidated sediments and remnants of a thin lava flow. T deep seated Franciscan formation also comprises the ridge that separates the reservoir trough from the Santa Clara Valley so that the basin occupied by the reservoir should be impervious against reservoi seepage. The reservoir is comparatively narrow seldom exceeding 2,000 feet in width but it would be fairly deep. Such canyon type of storage is a favorable feature tending to reduce evaporation loss. T presence of a major fault traversing the length of the reservoir is not conducive to percolation through it because the fault traverses plastic shales and sandstones that give a tight impervious gouge alon the fault zone.

REGIONAL GEOLOGY

The Mt. Hamilton Range is made up for the most part of old Jurassic sediments belonging to the Franciscan formation that outcrop over the area for many miles. The Coyote Creek watershed lies entirely within this Franciscan belt. Included between the four branches of the Haywards Fault zone are numerous large bodies of sediments much young in age than the Franciscan formation. Westerly from Coyote Creek and

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southerly from the Upper Coyote Gorge the narrow belt of hills that separates the fault zone from the Santa Clara Valley is composed chiefly of igneous Franciscan rocks that are largely altered to serpentine. These serpentine rocks also extend northwesterly across the gorge between the upstream toe of the Anderson Dam Site and the junction of Coyote and Las Animas Creeks, and in general, they comprise most of the the major portion of the hills on the west side of the West Branch of the Haywards Fault.

The slopes of the foothills facing the Santa Clara Valley are flanked in many places by poorly consolidated gravels, sands and clays of Pliocene lakebed origin. Thick beds of similar deposits also occupy an area about 1 1/2 miles wide and extending for 6 miles northwesterly from Coyote Creek between the West Branch of the Calaveras Fault and the West Branch of the Haywards Fault.

Toward the close of the Pliocene depositions a thin volcanic flow of basaltic lava covered most of the area west of the Haywards Fault and remnants of this flow still exist capping the foothills, especially over the area occupied by the serpentine rocks west of the fault zone.

GEOLOGICAL EXPLORATIONS

The geologic investigation of the dam site showed shale and sandstone outcrops along the base of the left abutment where the old county road originally ran, but above the average height of 35 feet above streambed no other bedrock outcrops were in evidence on this abutment. On the right abutment exposures of serpentine, shale and sandstone were in evidence along the base of the hill upstream from the axis of the dam and at various places along the right abutment slope. From these exposures and from a familiarity with the Franciscan formation it seemed most desirable to explore the foundation by means of surface trenching instead of drilling.

A bulldozer trench was carried down the left abutment along the upper portion of the axis that was augmented by hand trenching and pits along the bottom steeper portion of the abutment. Several other small bulldozer trenches were also dug around the brow of the axial ridge to determine the depth of stripping and the character of the overburden for its possible use as borrow material for the fill.

On the right abutment a shallow hand trench was carried down the axis from the crest of the ridge where the serpentine bedrock appeared at the ground surface. Here the residual soil was only a couple of feet thick and the rock was found to be fairly compact and of suitable character as foundation for the dam. Half way down this abutment the terrace overburden became quite thick and except for a [illegible] foot pit no attempt was made to follow the bottom of this bench. Further trenching was carried on along this axis just above the road.

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The channel section was explored by several pits and trenches nding outward along the axis from the base of each abutment. The ock appears to be quite flat and no attempt was made to explore ath the 100 foot wide stream channel

The spillway showed bedrock outcropping along both sides of channel opposite the end of the dam and so a 675 foot long bull-er trench was dug along its axis to determine the probable depth overburden above the bedrock which proved to be somewhat over feet in depth. A 225 foot long bulldozer trench was also dug ng the circular entry section to the spillway . Here the serpen-e bedrock was outcropping at the surface but was weathered rather ply. However the 8 foot deep trench showed that the serpentine k was gradually becomming tighter with depth and amply suitable to port the spillway structure.

On each abutment a terrace bench was encountered about 50 feet ove the stream channel neither of which was explored to its bottom t the uphill and the downhill bedrock exposures showed the approx-ate position of these terraces. The terraces may in part be com-sed of residual surface material that has slumped down the slopes ove. The left abutment terrace shows considerable terrace gravel t the right abutment terrace is made up principally of clayey ma-rial that may be underlain by gravel.

The conditions exposed by the exploratory trench along the kis of the dam site is shown upon the attached geologic section. nce this work was done the temporary axis along which the trench as located has been abandoned and a new axis for the dam has been elected which is about 100 feet farther downstream at the right end f the dam and about 250 feet farther downstream at the left end. owever, the original exploratory trench is representative of the con-ition along the newly selected axis.

OCAL GEOLOGY

~~The areal geology at the dam site is shown upon the attached contour map.~~ The Upper Coyote Gorge in which the Anderson Dam Site is located traverses rocks that belong to the Franciscan formation. The metamorphosed serpentine rocks occupy the upstream 2/3 of the gorge while the lower 1/3 of it is comprised of thinbedded sandstones and clay shales. The contact between these rocks crosses the channel about 450 feet upstream from the final axis of the dam site and runs diagonally through the upper portion of the right abutment intersecting the axis at about 150 feet above the streambed.

A dam site was once considered across the upper end of the gorge where the entire structure would rest upon the serpentine. Here the topographic conditions seem favorable for a dam but the geologic conditions are very poor . At the site selected most of the dam will be resting upon tight clay shales and sandstones which are adequately suited as foundation for an earth structure. The finally selected axis

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for the dam has been moved downstream more than is desirable from a topographic standpoint but the geologic conditions warrant it so that the inlet structure will not be landed on the unsound serpentine. When the reservoir is filled the serpentine will probably be subjected to further landsliding so that the proper location of the inlet tower and entry structure should be given serious consideration. The material might not only soften and swell but lateral slides could easily cause a dislocation of the foundation and even the tower itself.

The Franciscan formation was laid down about 150 million years ago and is comprised of the oldest rocks in this region. During this long period the formation has been subjected to regional tectonic movements and to long periods of cementation, crushing and metamorphism. The resulting sediments in the vicinity of the dam site are comprised of a predominance of clay shales that are interstratified with thin-bedded sandstones. The original hard igneous rocks that were intrusive into the formation contemporaneously with its deposition are now largely altered to various phases of hard and soft serpentine and also to a hard type known as silica-carbonate rock.

The metamorphism and alteration of the original basic igneous rocks has not only resulted in the various phases of the serpentine but it has also caused contact metamorphism whereby there has been alteration of the rocks that are now in contact with the serpentine. This fusion and alteration may be effective a hundred feet away from the contact. The shales generally become softened and schistose from this action while the massive sandstone often remains massive and altered retaining little semplance to its original composition and structure. On the right abutment there are numerous masses of rock of the latter type.

STRUCTURAL CONDITIONS

Due to the deep surface weathering and to the lack of bedding in the sandstone there are relatively few measurements available at present that show the attitude of the sedimentary beds over the entire site. The regional faulting and the tilting of the beds together with surface creep and deep surface weathering render the reliability of some of the structural measurements questionable.

Faulting is the chief structural feature of the region. The active Haywards Fault zone that runs along Coyote Creek through the Coyote Dam is probably comprised of two major faults, but as can be seen on the Vicinity Map this fault system branches into four distinct faults midway between the Coyote Dam and the confluence between Coyote Creek and Las Animas Creek. From here on in a northwesterly direction these branches become individual faults. All four branches pass to the east of the Anderson Dam Site so that the effect of earthquakes along any of these branches would not cause a dislocation or offset in the structure but would merely subject the proposed dam to earth vibrations.

A secodd structural feature is indicated on the Vicinity Map by a fine dotted line. The aerial photographs suggest a possible fault

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line connecting the small lake situated on the south side of the canyon with a straight lineal feature on the opposite side. This line is parallel to the Haywards Fault and is suggestive of some minor dislocation that might be associated with it. From a study in the field this line does not have much signicance for it seems to follow along a soft belt of serpentine close to the sedimentary contact on the left side of the canyon and continuing along an eroded depression for a short distance along the hills on the right side of the canyon. The line crosses the channel at the upstream toe of the proposed dam and continues through the serpentine just upstream from the entrance to the spillway.

LEFT ABUTMENT

The revised location of the dam as shown on the attached contour map of the site has the left end of the dam resting on the brow of the ridge. This has pulled the upstream toe of the dam downstream considerably from its original position in the channel section and has allowed a better foundation condition for the base of the intake structure. It is generally undesirable to have an embankment lap over the downstream side of a ridge but in this case it is probably justified because of the geologic conditions upstream.

The brow of the hill underlying the ~~the~~ left abutment, as shown by the axial trench, by the exposures along the base of the abutment and by the several trenches that have been dug around the hill, is composed of clay shale and some thinbedded sandstone. The configuration of the slope is also indicative that the overburden on the brow of the hill beneath the dam might not be so deep as found along the axial trench.

Exposures of shale and sandstone occur all along the old road cut upstream from the concrete bridge and at one place downstream from the bridge. Near the upstream toe of the dam the old road is crossed by a fence line which here marks the contact between the Franciscan sediments and the serpentine. Along the old road location beyond this fence there is first a 65 foot width of hard serpentine rock beyond which the formation is all soft weathered serpentine as far as the upper end of the gorge. In this soft serpentine area there are some extensive slides but they do not encroach upon the Franciscan sediments.

RIGHT ABUTMENT

As can be seen from the contour map the right end of the dam terminates at the crest of a serpentine knoll. The contact between the serpentine and the sediments runs diagonally across the abutment. Along this contact there are several hard outcrops of contact rock which was probably sandstone originally. The contact is well exposed at the base of the abutment below the road about 200 feet upstream from the axial trench. The serpentine encountered in the trench is fairly hard and suitable foundation for the dam and cutoff trench.

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can be carried away from the dam and discharged back into Coyote Creek safely below the downstream toe of the structure. This natural depression is bounded on its right side by a continuous mass of serpentine. Its entry section and the first 800 feet of its alignment are bounded by serpentine also and the character of this rock is fairly hard. The first 800 feet on the left side of the spillway are a part of the ridge against which the right end of the dam terminates. This ridge ends at the cross ravine where sandstone underlies the spillway section and from here on down the channel discharge section the foundation rock under the alignment as well as on the left side of it is composed of Franciscan sediments in the form of sandstone, chert and shale.

It is suggested that the first 800 feet of the spillway channel be entirely lined with concrete and that the remaining portion of the discharge channel be cut down to grade so that the spillway waters can discharge freely over the bedrock formation and find their own way down the slopes of the canyon to the stream channel.

OUTLET

A natural grade line already exists where the old abandoned road once ran along the base of the left side of the canyon. This old grade is about 30 feet above streambed. Outcrops of shale and sandstone are in evidence all along this old road cut so that little difficulty should be had in preparing a foundation along it for a cut and cover conduit from the reservoir.

This old road grade is now obliterated by serpentine slides upstream from the formational contact near the old fence line, but immediately upstream from the fence there is a hard rib of serpentine rock following along the contact that might prove satisfactory as the foundation for the inlet tower and structure. This serpentine is much like the igneous rock from which the serpentine was derived and in the past it was quarried for grading the roads. This mass of rock is about 65 feet wide but while it appears massive it should be explored to be sure that/it is not underlain by soft serpentine material.

AVAILABILITY OF CONSTRUCTION MATERIAL

The proposed Anderson Dam will require approximately 8 1/2 million cubic yards of embankment material. A reconnaissance of the area shows that there is ample material available for such use, but the closest borrow areas show a predominance of impervious clays. It would be desirable to obtain a large proportion of pervious fill, if possible to stabilize the slopes of the dam since it is proposed to place the impervious material in the central portion of the structure.

There is a large volume of residual clay along the flanks of the left abutment ridge facing the Santa Clara Valley which extends along the foothills for a long distance. This is the most accessible material.

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Sandstone outcrops are found along the abutment and in the ravine that runs down the slope toward the concrete bridge as well as at the spring where the spillway channel crosses this ravine. Sandstone of a very hard quality as well as considerable shale and bedded sandstone were encountered in the axial trench above the county road. On this abutment, as was found on the opposite side of the dam site, there is a terrace bench running along the slope of the hill about half way up the abutment above the road. The left abutment bench showed considerable terrace gravel but on the right abutment the material on this terrace bench is chiefly clay and residual rock fragments. Where the trench runs down the slope there is a slight bulge with serpentine rocks at the surface, but the trench excavation showed that surface rocky material was only serpentine float and that the material had evidently slumped down from the higher outcrops of rock and lodged in the terrace bench. A pit was sunk down into this slide material for a depth of 25 feet but at this depth neither bedrock nor terrace gravel had been encountered. This terrace bench is not believed to be so extensive along the hill side as at the trench location, because of the local slide condition, while downstream along this same position there are rock outcrops and the hill slope is quite uniform and steep.

CHANNEL SECTION

The channel section along the axis of the dam site is about 200 feet wide and bedrock was encountered at very shallow depths along the trench line for 50 feet out from the base of each abutment. The unexplored 100 foot wide section beneath the present stream channel is not believed to be over 25 feet deep at its maximum depth. Of the entire 1350 ~~feet~~ foot length of the channel section of the dam only the upstream 150 feet shows evidence of being underlain by serpentine, the rest being comprised of shale and sandstone. The channel section is undoubtedly filled with hard waterworn boulders and gravel but the low dam that forms the pool for the resort at the bridge and backs water up along the dam site to a depth of about three feet has caused the surface gravels to become covered with sand and silt.

CUT-OFF

The proposed earth dam will have its impervious section along the central portion of it and so the cut-off trench will be excavated somewhere beneath this area undoubtedly near the upstream edge of it. The depth of the cut-off will depend largely upon the character of the bedrock material encountered. The formation encountered along most of the cut-off will be shale and sandstone except near the upper portion of the right abutment where the serpentine rock has been exposed. This trench can all be excavated with a bulldozer and ripper beneath the overburden and even into the bedrock. The back fill material for the cut-off trench should be impervious clay that is properly compacted.

SPILLWAY

The spillway site is a natural depression just beyond the right end of the dam that leads across several low ridges where the water

The heavy stripping from the dam site and from the spillway channel can also be reworked for use in the impervious portion of the fill. Additional impervious material, if needed, can be obtained from the reservoir basin along Coyote Creek just above its junction with Las Animas Creek.

Pervious material is rather scarce in close proximity to the sit The channel section downstream from the dam site would afford a limite quantity of gravel but most of this area is in orchard and the existin flood plain of the creek is believed to be rather shallow below the gorge and to contain a large percentage of boulders and cobbles which would render it undesirable for compaction.

There is quite a sizable hill of red chert which is part of the Franciscan formation located about 1800 feet downstream from the axis of the dam on the right side of Coyote Creek that would afford a considerable yardage of excellent pervious fill.

The most promising borrow area for pervious material is believed to be the Pliocene deposition of gravels, sands and clays that are locally known as the Packwood Gravels. They occupy an extensive area along the east side of Las Animas Creek northerly from its junction with Coyote Creek. The haul from this area would be close to one mile which is not prohibitive if material can not be found closer at hand.

Riprap material for facing the dam is obtainable from two nearby sources. A flow of hard basaltic lava about 20 feet in thickness occupies a very accessible location only a few hundred feet upstream from the junction of Las Animas Creek and Coyote Creek along the east side of Las Animas Creek. A second source of riprap is a thick rib of hard silica-carbonate rock that is part of the serpentine formation. It has a nearly vertical attitude and extends up the side of the canyon as a bold outcrop and is located only about 1200 feet upstream from the axis of the dam site along the present county road.

Concrete aggregate will be required at the dam only in limited quantities. It would undoubtedly be more economical, to obtain this type of material from one of the nearby sources in the valley than attempt to salvage sand and gravel from the channel of Coyote Creek.

CONCLUSIONS

(1) The Anderson Dam Site is topographically and geologically a good location to construct a high embankment type of dam.

(2) The proposed height of 240 feet above streambed affords an excellent natural location for a spillway beyond the right end of the dam where the overflow would be safely removed from the structure and discharged back into its natural channel far removed from the downstream toe of the dam.

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John Richardson John H. Sutcliffe

Anderson Reservoir - Holiday Lake Estates March 30, 1973

There is a small pond located on District property just southerly of the Holiday Lake Estates boat launching facility at Anderson Reservoir. The pond has been proposed as a possible site for a boat parking and storage facility by a Mr. Hoffman, the leasee of the boat launching facility.

The pond was briefly investigated by our Engineering Geologist, Mr. James Vantine, several months ago when the proposal was first brought to the District's attention. His conclusion was that it would not be detrimental to the stability of the slopes in the area if the pond were drained and made into a parking lot. In fact, the draining of the pond could relieve the hydrostatic pressures on the slope just east of the pond and thus serve to increase the stability of the area. The construction of the parking facility at the pond site would therefore not appear to have any adverse geologic impact.

I have spoken with Mr. B. V. Amyx of the County Parks and Recreation Department concerning the above site. He has advised Mr. Hoffman to submit a formal proposal, including a geological investigation, for the site before he will be given a formal reply. Mr. Amyx felt that Mr. Hoffman would not submit a proposal and had changed his mind about the project, at least for the moment, due to the complaints of the local property owners who wish the pond left as is.

I do not believe it is necessary to arrange for any in-depth geologic investigation of the site due to our own geologist's investigation and the fact that the plan appears tohave been postponed.

ORIGINAL SIGNED BY

Associate Civil Engineer
Predesign Division

cc: D. Kriege
M. Burns
J. Vantine
J. Sutcliffe

JHS:zc

105-91 ⑳

CHESTER MARLIAVE
CONSULTING GEOLOGIST
and
REGISTERED CIVIL ENGINEER
420 Boynton Avenue
Berkeley, California

4-9-49

Mr. G.W.Hunt, Chief Engineer
Santa Clara Valley Water Conservation District
60 North Second Street
San Jose 18, California

Dear Mr Hunt:

The following memorandum is in confirmation of the views which I verbally express to you last Wednesday in the field after my geological reconnaissance of the Upper Coyote Gorge. On previous occasions I have studied the general geology of this area but have never before given serious consideration to the location for a dam in the gorge.

At your suggestion I spent all day of April 6th,1949, on a general geological study of the area having in mind the feasibility of constructing a dam somewhere in the gorge whose crest would be about at elevation 625 which is approximately 210 feet above streambed in the canyon. It is my understanding that with the high water at elevation 610 there would be an impounded storage of about 75,000 acre feet which is very desirable for the conservation of the flood waters of this stream.

Coyote Creek which is the main stream of this watershed flows northwesterly in this area where it is joined by San Felipe Creek which flows southeasterly along the same structural trough. At the junction of these two streams the Coyote Creek turns westerly almost at right angles to its previous course and cuts through the hills for a distance of 3,000 feet where the waters then turn northwesterly again and continue across the Santa Clara Valley toward the south end of San Francisco Bay.

Along this 3,000 foot stretch of gorge Coyote Creek drops about 25 feet in elevation. The most favorable topographic locations for a dam in this canyon are not geologically satisfactory because of the presence of soft sliding serpentine formations. However, there appear to be two locations that are quite free of this unfavorable rock where topographic and geologic conditions seem quite favorable for the construction of an earth dam having an approximate height of 210 feet above streambed. The axes of these two sites are about 2,000 feet apart and the difference in the elevation of the streambed at the two sites is about 15 feet.

At the upstream location the axis would be close to the contact between the massive silica-carbonate rock and the semi-consolidated sediments of the Packwood formation. At the downstream location the axis would lie across the old shales and sandstone of the Franciscan

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formation, and the entire dam would probably be resitng upon these rocks. Between these two sites the geologic formation is chiefly soft serpentine and its associated rocks which is traversed by a branch of the Hayward Fault that crosses the canyon somewhat parallel to the axes of the two suggested dam sites.

2. upstream site

On the right abutment of the upstream dam site there is a massive exposure of brown silica-carbonate rock which is badly fractured, cavernous, pervious and ~~and~~ unsuited as foundation for the impervious portion of an earth dam. While this massive outcrop would afford a shorter axis for a dam than the location selected, it is geologically unsound but it could be incorporated in the downstream portion of the dam. The spillway for the upstream location of a dam would be over the right abutment ridge through a steeply rising saddle where the minimum cut would be 100 feet vertically.

Downstream site

At the suggested downstream location for a dam in the gorge the bedrock conditions are seemingly favorable and the uniform slopes on each abutment indicate that satisfactory bedrock conditions would be found at shallow depths across the entire site. Here an excellent spillway location offers itself over a long flat saddle in the right abutment ridge where the existing surface elevation is about the same as the proposed crest of the dam. The flow from the spillway would discharge down a ravine safely removed from the downstream portion of the dam. Besides having more favorable foundation conditions and a more favorable spillway location than the upstream site, the downstream axis would be only about 1200 feet long as against 1500 feet for the suggested upstream axis. However, the downstream location would require a 15 foot higher dam to hold the water at the same elevation considered for the upstream reservoir but this would be partially compensated by the canyon storage between the two sites.

The writer feels that the downstream site is the preferable location for a dam if it is economically feasible but that both sites are worthy of consideration. The Packwood formation which is found in the reservoir site upstream from the gorge would afford ample material of satisfactory character with which to build an earth dam. It is somewhat closer to the upstream site but undoubtedly borrow pits could be found along the base of the foothills at the downstream end of the gorge where suitable material could also be found for use in constructing a dam at the downstream location if the upstream haul is too long.

Yours very truly,

Chester Marliave

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C O P Y

MEMORANDUM TO MR. W. H. HOLMES
Anderson Dam No. 72-9
Inspected April 24, 1950

By E. C. Marliave

The damsite was examined by the writer in company with Messrs. G. F. Engle, W. A. Brown, and R. B. Jansen, of this office, who met Mr. J. R. Roll, Resident Engineer for the Santa Clara Valley Water Conservation District, on the morning of April 24, 1950. Particular attention was given to the exposed serpentinized area of the upper right abutment lying immediately adjacent and upstream of the proposed impervious section.

The contact between sandstone and sheared faulted serpentine on the upstream side strikes diagonally downstream across the canyon from the left to right abutment. This soft faulted contact forms pronounced topographic features in each canyon wall and particularly so on the left wall where a sharp break in slope is noted. The average strike is N74W and the dips vary considerably due to the folding and distortion of the beds, but generally dip steeply upstream. Zones of varying widths, from 6 to 20 feet wide, are severely crushed and faulted and much of the serpentinized material is soft and powdery. Numberous cross faults are noted in this material. The serpentinized material disclosed by stripping at higher elevations on the right abutment is of poor quality, but additional stripping will not improve it greatly. The present stripping depths are in the order of 20 feet normal to the surface and it appears that depths in the order of 10 feet normal to the surface should suffice as little improvement is observable at greater depths. It does not appear possible to keep this type of material from becoming saturated. Any blanket or cutoff provided would merely increase the time required to saturate this material. It is quite possible that this material will be unstable when saturated. The only feasible means of keeping it in place is to provide sufficient ballast by means of a heavy rock blanket. The material will be fairly well confined by the dam itself, and any additional rock or the proposed filter blanket. It would seem highly desirable to test this serpentinized material for stability and shear when saturated and determine the amount of blanket or ballast required to insure stability as the result of such tests.

Donwstream from this serpentinized contact, in the channel section, is hard but fractured massive gray sandstone, apparently of Franciscan age. The attitude of the beds as near as can be determined is approximately the same as that of the sheared zone. Measurements on one bed indivate a N55W 72N attitude. As excavation proceeds adjacent to the channel section on either side, the continuity of this rib should be checked as it is believed there may be another shear or fault zone in the channel section. The material exposed in the bottom of the foundation is much fresher and more massive than the corresponding sandstone near crest elevation. It should improve progressively with decreasing elevation below the crest and also with depth below the surface of the ground.

The continuity of the sheared zone along the serpentinized contact should be checked as excavation proceeds for a possible offset in the channel. A spring on the right abutment, about 20 feet above normal streambed, appears to be associated with this fault zone and when excavation has been completed, it may be necessary to provide a drain for this spring. After excavation the character of the wet material in the vinicity of the spring should be a fair indication of the nature of the saturated serpentine abutment rock. Tests might well be made on the saturated material at this lower elevation.

A wagon drill sank a 20 foot hole in the gray sandstone material under the impervious section near the cutoff line. Small leakage was observed under 20 pounds of pressure when water was applied to the hole with the packer set at 3 feet below the surface. With the packer set at 5 feet below surface, no seepage of water was observable although the pressure dropped 3 pounds in 10 minutes. From this single test, it would appear that portions of the foundation in the gray sandstone are reasonably watertight and will not accept much

C. V. W. C. D.
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grout, however, other portions of the sandstone are strongly fractured and in some cases shattered and this test should not be accepted as a criteria.

This job should be followed closely and every effort made to improve the stability of the serpentinized material under the upstream portion of the right abutment.

It is now contemplated using the fine talus material along base of slope of the hill of silica carbonate rock as a transition section adjacent to the upstream portion of the impervious section. The material in general appears suitable for rock fill. Whether the brittle rock will break down under crawler type tractors and become springy or impervious remains to be seen. If much equipment passes over these fines, there may be appreciable undesirable breakdown. A few truckloads of this material might be tested by driving cats over the material when wet to observe breakdown characteristics.

ECM:STB
4-26-50
cc W. H. Holmes
Los Angeles

E. C. Marliave

S. C. V. W. C. D.
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Excerpts from Dr. George D. Louderback's letter dated June 8, 1950, on Well Logs.

Holes 1 [illegible] correspond to what was expected from surface observations, including the thickness of an apparently unfractured sandstone member (Hole 1-A).

Hole 2, if the determinations are correct, indicates that the extension of serpentine across the streamway under the sediments of the right abutment is in the form of an offshoot or dike from the main body of serpentine. Along the line of the hole it would be only 9½ feet thick. This would explain the attitude of the serpentine contact near the axis on the mid-slopes of the right abutment, which is at variance with the main contact seen in the left slope and canyon floor.

Hole 4 shows that the stream deposits in the left abutment extend deeper than expected. The hole is apparently entirely in alluvial material covered in part, [illegible], by talus from the upper slope. The hole evidently did not penetrate into bedrock, although its bottom reached elevation 424. The explanation would appear to be that the area was traversed by an actual stream channel rather than being a simple terrace formed by lateral swing of the stream. As to whether the "cemented gravel" is water tight remains to be determined, but the materials above 0-14 ft.) and below (44-50 ft.) should be definitely pervious. Such stuff should normally be removed. If because of its depth there is any intention to retain part of it, in my opinion the whole width of the belt under the impervious section should be thoroughly tested and proof obtained that it can be satisfactorily treated to a sufficient depth to make suitable foundation. (See also my report of June 5, page 2, Left abutment.)

Partial slide (?) on left abutment

How deep hole (?)

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③ N5-41

STER MARLIAVE
ONSULTING GEOLOGIST
and
REGISTERED CIVIL ENGINEER
420 Boynton Avenue
Berkeley, California

June 12, 1950

Mr. Geo. Walter Hunt, Chief Engineer
Santa Clara Valley Water Conservation District
60 North Second Street
San Jose 18, California

Subject: Anderson Dam

Dear Mr. Hunt:

Your letter of May 23rd was received some time ago. The letter from Mr. Holmes that you enclosed requested copies of any reports that I had sent you since my geological report of 9-15-49. As you know I have not sent you any further data. I logged the outlet trench before it was backfilled and have made measurements on the formations that were exposed in the channel section before any fill was placed in that area.

I have copies of the log of the out trench and have already given a copy of the section along it to Dr. Louderback. The measurements of bedrock in the channel section and along a portion of the right abutment were made from the grid system but do not mean much unless they are plotted upon the final bedrock contours. I showed this data which was plotted on the original ground contours to Dr Louderback but he thought that the information did not mean much unless it was on the final contour map, with which I agree. As soon as you have some final bedrock contours available I will place this data upon them.

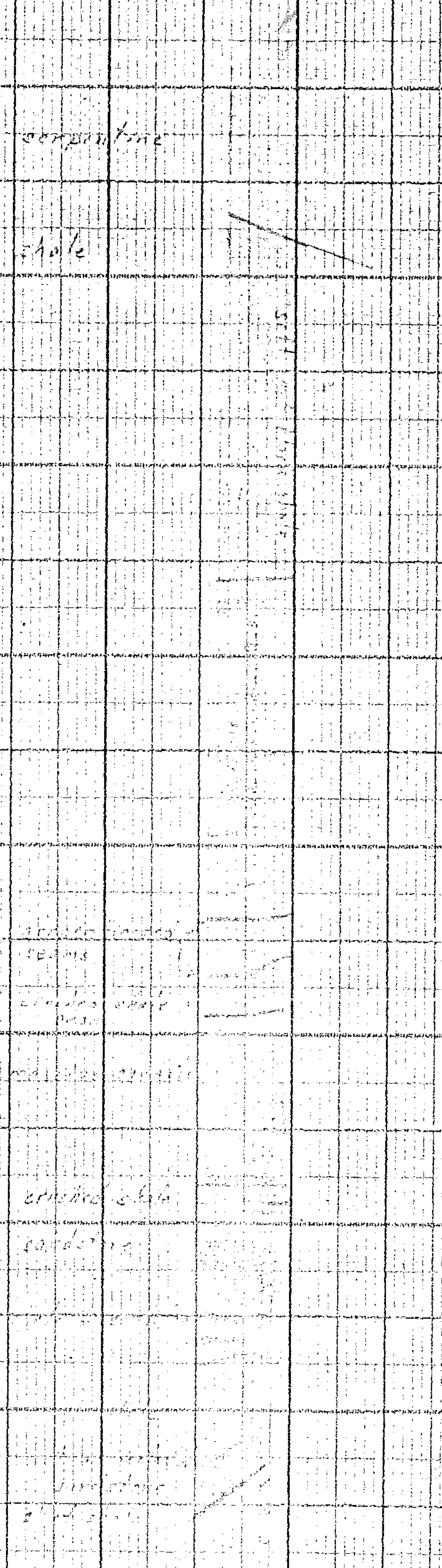
On June 2nd I had a session with Dr Louderback at my office at which time I showed him all of my maps and data. He took a copy of the log of the outlet trench but did not take any other data. I showed him my aerial map of the dam site which gives a much better view of the dam site than the maps we showed him at the conference in the field. He seemed to concur with our views regarding the faulting and the serpentine and did not appear to be concerned over either of these conditions. He also stated that he thought that we had selected the best location for the axis of the dam site.

Burton is away at army camp but will return on June 18th. It would be well for one of us to get the latest excavated contours and plot the geologic data upon them including any new data that has been found.

Yours very truly,

Chester Marliave

S. C. V. W. C. D.
MICROFILMED — JANUARY [illegible]
PG. 1 OF 2


serpentine
shale
seams
crushed shale
sandstone
limestone

STATE OF CALIFORNIA
Department of Public Works
SACRAMENTO

June 13, 1950

ADDRESS REPLY TO
DIV OF WATER RESOURCES
LIC WORKS BUILDING
P. O. BOX 1079
SACRAMENTO 5

Mr. George W. Hunt, Chief Engineer
Santa Clara Valley Water Conservation District
60 North Second Street
San Jose, California

SUBJECT: Leroy Anderson Dam No. 72-9

Dear Mr. Hunt:

This office has recently received two communications from Dr. George D. Louderback, consultant geologist, relative to the Anderson Dam, which are in the form of answers to questions propounded by this office. Dr. Louderback's answers are based upon the data made available to him and his inspections of the damsite on May 19 and June 3, 1950.

The attached excerpts from Dr. Louderback's letters are for your information.

Very truly yours,

A. D. Edmonston
State Engineer

Enclosure

S. C. V. W. C. D.
MICROFILMED – JANUARY 1969
PG.________OF________

A5-41 ⑤

Excerpts from Dr. George D. Louderback's letter dated June 5, 1950.

TEST DRILLING AND GROUTING (Q.1)

Foundation under valley bottom.

On the day of the field inspection the area of foundation under the valley floor was covered by embankment material and not available for observation. Judged from more or less satisfactory exposures of the formation in the lower part of the canyon sides, especially on the left slope, the area of now concealed foundation upstream from the center line and underlying the impervious section of the dam is made up of a series of alternating sandstones and shales of the Franciscan (Jurassic) formation, with about 100 feet of an old igneous rock intercalated in the series, as seen in the left abutment about 375-475 feet upstream from the center line at about elevation 425. It may not extend entirely across to the other side of the canyon floor. This series crosses the streamway at an angle with a roughly northwesterly trend, the strata dipping mostly at high angles northeasterly or vertically. This is a favorable arrangement and composition of material for the type of dam and its location with respect to the reservoir involved in the project.

The unweathered sandstones are hard, and impervious except where locally fractured, and are separated by shales, with the stratification planes across the lines of flow from reservoir down stream. The igneous rock is more massive, and where fresh is hard, and impervious except where affected by local fracturing.

A foundation of this composition and general structure, under the valley floor, if the excavation was carried below the weathered zone, and the rocks were not badly fractured, should be quite satisfactory. The situation with respect to these two conditions should have been observable in a properly cleaned off foundation surface.

According to available reports, the cleaned foundation was inspected May 1, 1950, by G. F. Engle and R. B. Jansen and "was considered to be structurally sound and adequately impervious" (R.B.Jansen 5/17/50). Previously, April 24-30, twelve test holes (av. depth 20 feet) were put down, all but two being dry. Seven in a row parallel to the axis of the dam were water tested at about 22 psi for 15 minutes. Mr. Stevens, grout expert for the contractor, was present. It was concluded that grouting was unnecessary (R.B.Jansen 5/2/50).

While the tests made were not very thorough, the reports indicate that the excavation was carried into unweathered formation, that in general the foundation is firm and hard, and probably sufficiently impervious. Notwithstanding these favorable probabilities, if the proposed test holes (Letter, Edmonston to Hunt, 5/22/50) at low elevation (such as the one designated at elev. 403) in the abutments point to the treatment of that part of the foundation, it would be a reasonable precaution to check with some test holes under the upstream part of the impervious zone in the canyon bottom.

The abutments.

The conditions under the canyon side slopes are sufficiently different to require special consideration. The effects of weathering may be [illegible]

S.C.V.W.C.D.

MICROFILMED - JANUARY 1969

PG. 1 OF 5

R5-#1

penetrate deeper; and the narrowing of the abutment spurs and of the dam, together with the diagonal arrangement of the formations across the site results in the impervious zone lying on a single rock type instead of the alternations found in the bottom foundation. Such alternations introduce natural cutoffs between layers which through fracturing or otherwise may be locally more or less pervious.

terrace deposits in older lower portion of dam - Sisk this core 15 min inside line

Left abutment. At mid elevations (475 to about 540 on the Marliave map) stream terrace deposits occur. Their depth is unknown. They should be removed under the impervious section of the dam, just as the stream materials were removed from the present river bed. They may be usuable for embankment material but in their natural state are not compacted, and they may contain pervious gravel layers.

Above the terrace deposits the whole site appears to be occupied by an old igneous rock which is broken up into small fragments (up to a few inches in diameter) at and near the surface. Its area may extend down under the terrace deposits. It may be expected to become fresh and hard with depth. The extent and condition of fracturing at such depth is unknown.

** Greenst

fracturing & 9-5.

Right abutment. In the lower slopes the same general considerations apply; that is, the rock may be expected to freshen and harden up with depth. It is near the serpentine contact zone and the extent to which it has been sheared or fractured is not known. The upper part of the slope is in serpentine which will be separately considered in the next section.

General. The rocks underlying those parts of the abutments just mentioned are of types that under normal conditions would produce hard, firm, and otherwise satisfactory foundation. The site, however, lies in an area of marked geological disturbance. Under these circumstances it would seem desirable to put down a number of test holes along the belt underlying zone 2. These should preferably be core borings so that the nature of the material passed through can more definitely be determine, followed by appropriate water and grouting tests.

THE SERPENTINE AREAS (Q 2 and 3)

A large area of serpentine occupies the upper part of the Upper Coyote Gorge and the main ridge through which the gorge is cut. Its down-stream boundary crosses the creek diagonally and strikes about 74 degrees west of north. At the base of the left abutment it is close to the intake of the outlet conduit and it crosses the canyon floor under zone 1 of the dam.

Along this course the boundary of the serpentine and the Franciscan sediments is markedly faulted. The physical condition of the broad fault zone is well displayed in a cut made in preparation for the intake structure, and in the bank to the east. On one side of the contact the serpentine is badly sheared, and on the other side the shale is crushed and ground into a clayey mass in which the original structure is destroyed. This condition apparently extends up the slope to the top of the ridge.

S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 2 OF

The inlet valve and approach

Louderback's recommendation at inlet structure

The water-saturated sheared serpentine under normal reservoir conditions, and particularly on the occasion of any ground disturbance such as may be caused by earthquake is likely to slide and obstruct the inlet. The greatest threat of sliding on a large scale would be in a heavy winter and flood conditions and with water surface. The natural slope has been locally oversteepened by excavation in the vicinity of the inlet structure. As a protection to the structure and reduce the possibility of blocking the inlet, it is recommended that the slope be reduced back of the cut and on the spur upstream from the inlet and further stabilized by a rock-fill blanket. It would also be desirable to arrange for possible intake of water at a higher level, above the probable reach of landslide debris.

Right Abutment

The sheared and weakened condition of the serpentine is also found in the right abutment where it is overlain by zone 1 and occurs in the slope above and also upstream of the toe of the dam. The conditions are very favorable for sliding with rock saturated. Sliding in this slope may injure the upstream portion of the dam, might reach up to the entrance structure of the spillway, and even involve the crest ridge of the dam. In my opinion it is of great importance to take measures to stabilize this slope by a substantial rock blanket.

Running up the right abutment, the serpentine belt cuts entirely across under the dam. Much of it is soft and sheared and a considerable amount of such soft material had been excavated at the time of my visit. The lower part of the serpentine slope will probably be stabilized by the embankment covering. The upper part near the crest is closely related to the slope mentioned in the preceding paragraph. As the dam terminates in a local ridge between it and the spillway depression, it is not likely to suffer sliding disturbance if the slopes immediately below are so protected as to remain intact.

Sliding up the canyon. (Q.4)

Slide which is [illegible] #14 slope [illegible] is located,

In past time a large slide has occurred in the left canyon slope not far above the dam site. It is terminated upward by a striking cliff, which is at an elevation well above the top of the dam. The mass of serpentine that moved down the slope undoubtedly stopped in a condition of stability under the conditions then prevailing. Whether the sliding action was brought about as a result of a heavy rainy season or was precipitated, possibly in a normal season, by a strong earthquake is not known. Future slumping from the steep cliff would dump material on the upper end of the slide with little chance of its directly reaching the reservoir. The present slid mass, if it did not come to rest under saturated condition, may, if its lower part becomes saturated with reservoir water, lose its stability and move down towards the canyon floor. A slide entering the reservoir will disturb the water surface. One coming from a new and steeper slope should produce larger waves than one occurring in the old slid mass.

Serpentine occupies practically all the canyon slopes upstream from the dam site to the creek forks. There may be other slopes subject to sliding besides

S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 3 OF

A5-41

the one described. I can suggest no way within the range of reasonable expense to protect all such slopes from possible sliding. The possibility of water waves at time of high water, originating either from slide action or earthquake shock, should be taken into consideration in connection with the dam design.

FILL MATERIAL

The chert hill quarry material was being used at the time of my visit for the downstream pervious section (zone 4). The quarry rock consists of Franciscan chert which is likely to be a fairly hard to very hard rock that breaks down into usually small fragments as a result of the fracturing of the layers, and an associated old volcanic rock (basalt) which yields dense hard irregular to roundish chunks. Both types seem satisfactory for pervious fill. The weathered shales associated with the cherts and the weathering products of the volcanic are heavily charged with a dark red clay which is an undesirable admixture in pervious fill. This condition may improve with depth, ~~but if not,~~ it would seem feasible to adopt a simple method of removing most of the clay without wasting much of the harder, more suitable material.

It was planned to use the silica-carbonate rock, which occurs in a belt in the right canyon slope upstream from the dam, as pervious fill in zone 1. At the time of my visit this material had not been blasted to show how it would break down. Such rock commonly breaks into large hard masses. The proportion of smaller stuff (5 inches and under) will depend largely on the relative quantity of silica and carbonate in the composition. It is satisfactory for pervious fill or for riprap in so far as appropriate sizing can be conveniently obtained.

The Packwood Formation in general may consist of gravels, sands, sandy clays and clays. It is likely that there could be obtained from it by proper selection from appropriate layers material suitable for either pervious or impervious fill. It has not yet been opened up by quarry operations. Its nearest occurrence in quantity is along Las Animas Creek north of its junction with Coyote Creek.

Extreme North end reservoir

Another source of material for pervious fill is the layer of younger volcanic rock that occurs on the east side of Las Animas Creek at and near the junction of Coyote Creek. It has not been opened up by quarrying but as observed elsewhere in the region it is a fairly fresh, hard basaltic rock.

General. The material used at the time of my visit for impervious and for pervious fill close to the dam site appeared to be reasonably satisfactory. There also appears to be sufficient suitable construction material of both types within less than a mile upstream from the dam site.

EARTHQUAKES (Q.6)

This area is liable to be subjected to very strong earthquake shock. In my opinion, the stability factor suggested (more than unity with a horizontal force of 0.2 gravity) is a minimum precaution with respect to the dam.

S. C. V. W. C. D.
MICROFILMED – JANUARY 1969
PG. 4 OF

Exceppts from Dr. George D. Louderback's letter dated June [illegible], 1950, on Well Logs.

Holes 1 and 3 correspond to what was expected from surface observations, including the tightness of an apparently unfractured sandstone member (Hole 1-A°.

Hole 2, if the determinations are correct, indicates that the extension of serpentine towards the streamway under the sediments of the right abutment is in the form of an offshoot or dike from the main body of serpentine. Along the line of the hole it would be only 9½ feet thick,. This would explain the attitude of the serpentine contact near the axis on the mid-slopes of the right abutment, which is at variance with the main contact seen in the left slope and canyon floor,

Hole 4 shows that the stream deposits in the left abutment extend deeper than expected. The hole is apparently entirely in alluvial material covered in part, perhaps, by talus from the upper slope. The hole evidently did not pentrate into bedrock, although its bottom reached elevation 424. The explanation would appear to be that the area was traversed by an actual stream channel rather than being a simple terrace formed by lateral swing of the stream. As to whether the "cemented gravel" is water tight remains to be determined, but the materials above (o-14 ft) and below (44-50 feet) should be definitely pervious. Such stuff should normally be removed. If because of its depth there is any intention to retain part of it, in my opinion the whole width of the belt under the impervious section should be thoroughly tested and proof obtained that it can be satisfactorily treated to a sufficient depth to make suitable foundation.(see also my report of June 5, page 2, Left Abutment.)

S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 5 OF 5

15-23

Excerpts from Dr. George D. Louderback's letter dated June 8, 1950, on Well Logs.

Holes 1 and 3 correspond to what was expected from surface observations, including the tightness of an apparently unfractured sandstone member (Hole 1-A°.

Hole 2, if the determinations are correct, indicates that the extension of serpentine towards the streamway under the sediments of the right abutment is in the form of an offshoot or dike from the main body of serpentine. Along the line of the hole it would be only 9½ feet thick,. This would explain the attitude of the serpentine contact near the axis on the mid-slopes of the right abutment, which is at variance with the main contact seen in the left slope and canyon floor.

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S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 5 OF 5

Oceanic To Build Anderson Lake Community

By BEN HAWKINS
Staff Writer

A low density "recreational community" on 8,900 acres flanking the north and east shores of Lake Anderson in south San Jose, has been proposed by Oceanic California, Inc., developer of Sea Ranch on the Sonoma County coast.

The proposal is to create 5.000 dwelling units and homesites in a carefully preserved environment in which about half the acreage would be left in open space, in addition to open areas of large lots up to five acres.

The plan will open up public and private access to Lake Anderson and surrounding areas, most of which is now a fenced and patrolled cattle ranch. Lake Anderson represents a relatively untapped recreational resource.

Robert Minckler, senior vice president and general manager of Oceanic California, Inc., noted the proposal is consistent with the stress of the San Jose General Plan on orderly development of new neighborhoods and its designation for Lake Anderson. Oceanic is the California subsidiary of Castle & Cooke.

The project will cover the site of the "Hamilton 'new town' plan," proposed in the mid-1960s when the lake lands were annexed to San Jose.

However, the new development envisions only 5,005 dwelling units of various types with a projected population of 16,870 at the end of a 20-year development period, compared to the "Hamilton" plan for about 30,000 dwelling units and 100,000 persons.

It has a total overall density of about ¾ dwelling units per acre, or three units for every four acres in the 7,200 acres of the 8,900 within the San Jose city limits.

Much of a planned private park and planned wilderness area is outside the city.

Applications to change the present single-family zoning to agricultural-planned development have been filed with the San Jose planning department, which is reviewing them and preparing an environmental impact report. Public hearings are to be held in May and June.

The required zoning will give the city greater control over the development.

"It gives access to the lake for many people, but in a way that won't destroy its natural beauty," said Dick M. Wilkinson, vice president and director of project development. He noted that several thousand trees will be planted in the rolling hills, which have been virtually denuded by many years of cattle grazing.

The development will include single-family lots, townhouses, garden apartments and condominium units.

It will also have commercial convenience shopping areas that will eventually include motels, restaurants, auto service facilities and nurseries as well as a professional office area.

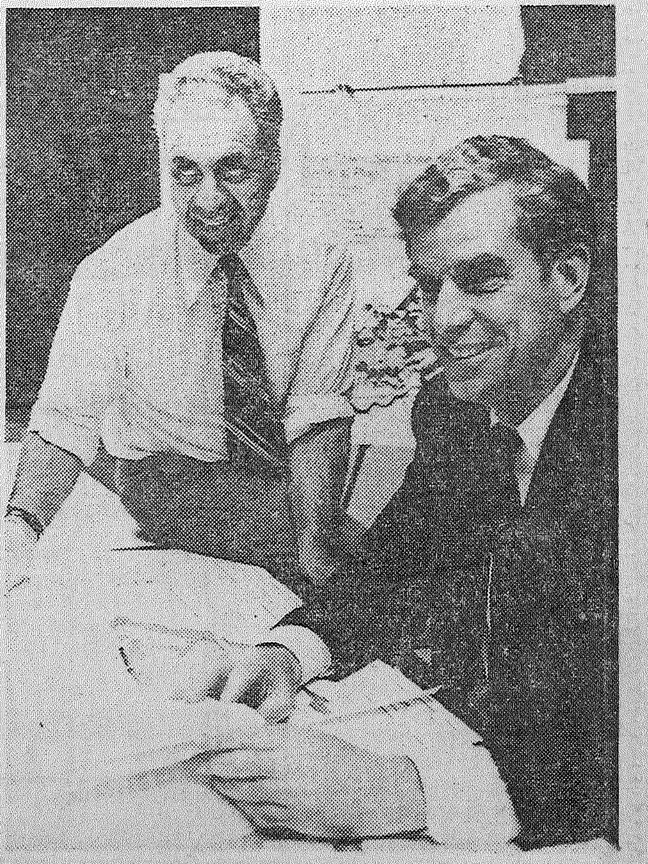
Sites for four elementary and two middle schools are reserved and arrangements for school service are being studied with the Morgan Hill Unified School District.

Designated open space areas will cover about half of the land area, including the 18-hole Riverside golf course, a private recreation park open to public membership, scenic open space and a large wilderness park, the developers said.

Annexation papers have been filed with the city for the 154-acre golf course, which was part of the original land acquisition but which was never annexed to the city.

Wilkinson said the "rural and recreational character of the community will be fostered by the lake and valley views and the physical proximity of linked open space areas."

General plan consultant on the development is Samuel H. Halsted of Menlo Park. Wilkinson was at one time town administrator for Woodside and Halsted was mayor of Portola Valley.



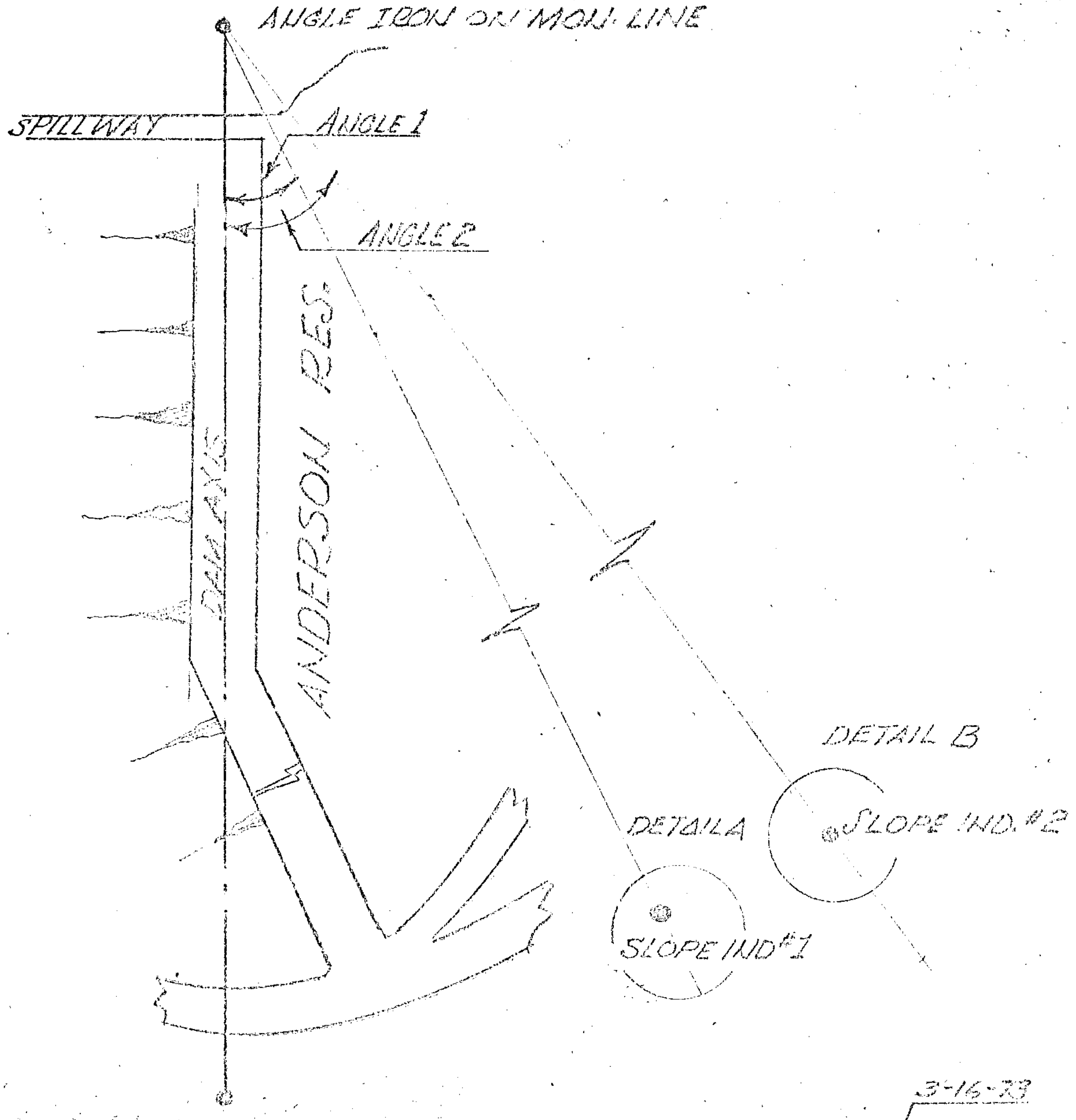
ED TERESI, BOB MINCKLER
. . . Reveal low-density 'New Town'

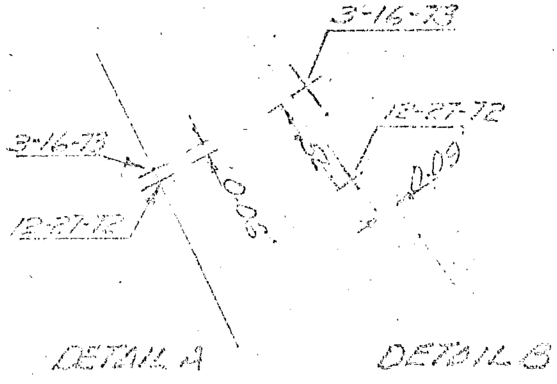
P-1

SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT, San Jose, California

By________ Date________ Chkd. By________ Date________ Sheet No.____ of____

Subject MONITORING OF SLOPE INDIC. ANDERSON RES. Job No.________





	SL. IND. #1		SL. IND. #2	
	DIST.	ANGLE 1	DIST.	ANGLE 2
12-27-72	1807.71	26-27-15	1291.75	57-55-19
3-16-73	1807.65	26-27-16	1291.23	57-55-23

NOTE: DIST. SHOWN ARE SLOPE DIST.

March 14, 1973

Shannon and Wilson, Inc.
Soil Mechanics and Foundation Engineers
1550 Rollins Road, Suite F
Burlingame, California 94010

Attention: Mr. Rudy Dietrich

Gentlemen:

Attached are the results of the most recent surface survey of the center of the slope indicators which are on the left abutment of Anderson Dam. During the period between December 27, 1972 and March 9, 1973, the slope indicator nearest the dam showed down-slope movement of .06 feet while the slope indicator furthest from the dam showed movement of .53 feet. The accuracy of the measurement is about 0.02± feet.

Sincerely yours,

James V Vantine

Jim Vantine
Engineering Geologist
Resources Management Division

Attachment

cc: J. Watkins
D. Kriege
✓J. Vantine

JV:lm

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

November 27, 1973

Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. Tom Iwamura
Engineering Geologist

Re: Inclinometer Readings
Anderson Dam

Gentlemen:

At your request, data for inclinometer casings SI-1A and SI-2 were obtained on November 19, 1973. The location of the casings is shown on Fig. 1. Plots of lateral movement versus depth are enclosed as Fig. 5, 8, and 9. The calculator printout sheets showing initial and current differences and actual inches of deflection are also enclosed.

Inclinometer casing SI-1A was found to be so deformed by additional movement since the last reading that the instrument would not proceed past a depth of 48.5 feet in the north and south slots. In our report of March 20, 1973, we reported movement at the top of SI-1A in the order of eight inches in the north direction. The shape of the lateral movement versus depth curve for the current readings is approximately the same as for the March 14, 1973, readings above a depth of 48 feet. The data relative to a depth of 48 feet is tabulated on sheet 1 of 4. The deflection relative to the bottom is not known, and a plot of current north-south data is not presented.

The east-west slots of inclinometer casing SI-1A were open and read to a depth of 74.0 feet. The top of the casing has moved in the order of 1.8 inches in the west direction since installation or 0.3 inch since March 14, 1973. The movement is occurring above a depth of about 48 feet.

The top of SI-2 indicates a 1.5 and 0.7 inch of total movement in the north and east directions, respectively. The movement of this casing is still confined to the upper ten to 12 feet of hole. No movement is indicated below a depth of 12 feet.

Please advise if you have any questions or require further information.

Very truly yours,

SHANNON & WILSON, INC.

By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

Enclosures: Figures 1, 5, 8, and 9
Tables SI-1A and SI-2

Sheet 1 of 4

Date of Readings 11-19-73

SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-1A

Depth FT.	Initial Diff.	N+	S-	Diff.	Change	Def'l. In.
1.0	-86	523	591	-68	18	5.91
2.5	-82	525	590	-65	17	5.83
4.0	-81	526	590	-64	17	5.75
6.0	-134	484	631	-147	-13	5.65
8.0	-135	484	631	-147	-12	5.73
10.0	-136	484	631	-147	-11	5.80
12.0	-141	484	631	-147	-6	5.86
14.0	-145	483	631	-148	-3	5.90
16.0	-191	469	646	-177	14	5.92
18.0	-194	465	650	-185	9	5.83
20.0	-198	461	654	-193	5	5.78
22.0	-201	458	657	-199	2	5.75
24.0	-203	456	659	-203		5.74
26.0	-247	436	678	-242	5	5.74
28.0	-252	435	680	-245	7	5.71
30.0	-255	432	682	-250	5	5.67
32.0	-260	431	683	-252	8	5.64
34.0	-261	434	681	-247	14	5.59
36.0	-318	417	697	-280	38	5.50
38.0	-326	413	702	-289	37	5.28
40.0	-332	402	712	-310	22	5.05
42.0	-320	393	717	-324	-4	4.92
44.0	-311	396	721	-325	-14	4.95
46.0	-357	616	511	105	462	5.03
48.0	-368	755	369	386	754	2.26

NOTE: Casing deflection in inches as shown is not relative to initial location of the bottom of casing and, therefore, erroneous.

Instrument would not descend below a depth of 48 feet.

Date of Readings 11-19-73

SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-1A

Depth Ft.	Initial Diff.	E+	W-	Diff.	Change	Def'l. In.
1.0	82	599	515	84	2	-1.79
2.5	85	599	515	84	-1	-1.80
4.0	87	602	514	88	1	-1.79
6.0	169	635	478	157	-12	-1.80
8.0	175	637	476	161	-14	-1.73
10.0	177	639	474	165	-12	-1.64
12.0	177	640	473	167	-10	-1.57
14.0	177	641	472	169	-8	-1.51
16.0	175	645	470	175		-1.46
18.0	172	642	472	170	-2	-1.46
20.0	169	639	475	164	-5	-1.45
22.0	165	637	478	159	-6	-1.42
24.0	163	635	480	155	-8	-1.38
26.0	113	613	503	110	-3	-1.34
28.0	107	609	505	104	-3	-1.32
30.0	103	608	507	101	-2	-1.30
32.0	98	606	510	96	-2	-1.29
34.0	91	602	514	88	-3	-1.28
36.0	78	588	527	61	-17	-1.26
38.0	74	586	528	58	-16	-1.16
40.0	72	587	528	59	-13	-1.06
42.0	72	591	528	63	-9	-.98
44.0	81	589	525	64	-17	-.93
46.0	16	535	576	-41	-57	-.83
48.0	12	532	582	-50	-62	-.48
50.0	17	579	554	25	8	-.11
52.0	17	565	550	15	-2	-.16
54.0	9	558	557	1	-8	-.15
56.0	-33	541	576	-35	-2	-.10
58.0	-34	538	576	-38	-4	-.09
60.0	-37	538	579	-41	-4	-.06
62.0	-39	536	579	-43	-4	-.04
64.0	-40	538	577	-39	1	-.02
66.0	-85	520	593	-73	12	-.02
68.0	-87	516	599	-83	4	-.09
70.0	-89	512	603	-91	-2	-.12
72.0	-87	508	606	-98	-11	-.11
74.0	-86	507	608	-101	-15	-.04

Date of Readings 11-19-73

SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-2

Depth Ft.	Initial Diff.	N+	S-	Diff.	Change	Def'l. In.
1.0	29	578	533	45	16	1.52
2.5	30	585	537	48	18	1.45
4.0	33	583	532	51	18	1.37
6.0	88	625	486	139	51	1.26
8.0	88	642	472	170	82	.95
10.0	88	635	478	157	69	.46
12.0	86	608	505	103	17	.05
14.0	87	598	516	82	-5	-.05
16.0	47	581	535	46	-1	-.02
18.0	47	581	535	46	-1	-.01
20.0	47	580	536	44	-3	-.00
22.0	47	581	535	46	-1	.00
24.0	45	579	536	43	-2	.01
26.0	47	581	535	46	-1	.02
28.0	47	583	536	47		.03
30.0	58	586	528	58		.03
32.0	54	585	531	54		.03
34.0	54	585	531	54		.03
36.0	65	590	524	66	1	.03
38.0	64	589	525	64		.02
40.0	64	589	525	64		.02
42.0	62	589	526	63	1	.02
44.0	63	588	526	62	-1	.02
46.0	64	590	525	65	1	.02
48.0	64	590	525	65	1	.02
50.0	67	591	524	67		.01
52.0	63	588	526	62	-1	.01
54.0	61	590	528	62	1	.02
56.0	66	590	525	65	-1	.01
58.0	65	590	525	65		.02
60.0	64	589	525	64		.02
62.0	61	588	527	61		.02
64.0	63	589	525	64	1	.02
66.0	40	579	536	43	3	.01
68.0	40	578	537	41	1	-.00
70.0	46	580	534	46		-.00
72.0	46	580	535	45	-1	-.00
74.0	44	579	536	43	-1	-.00

Sheet 4 of 4

Date of Readings 11-19-73

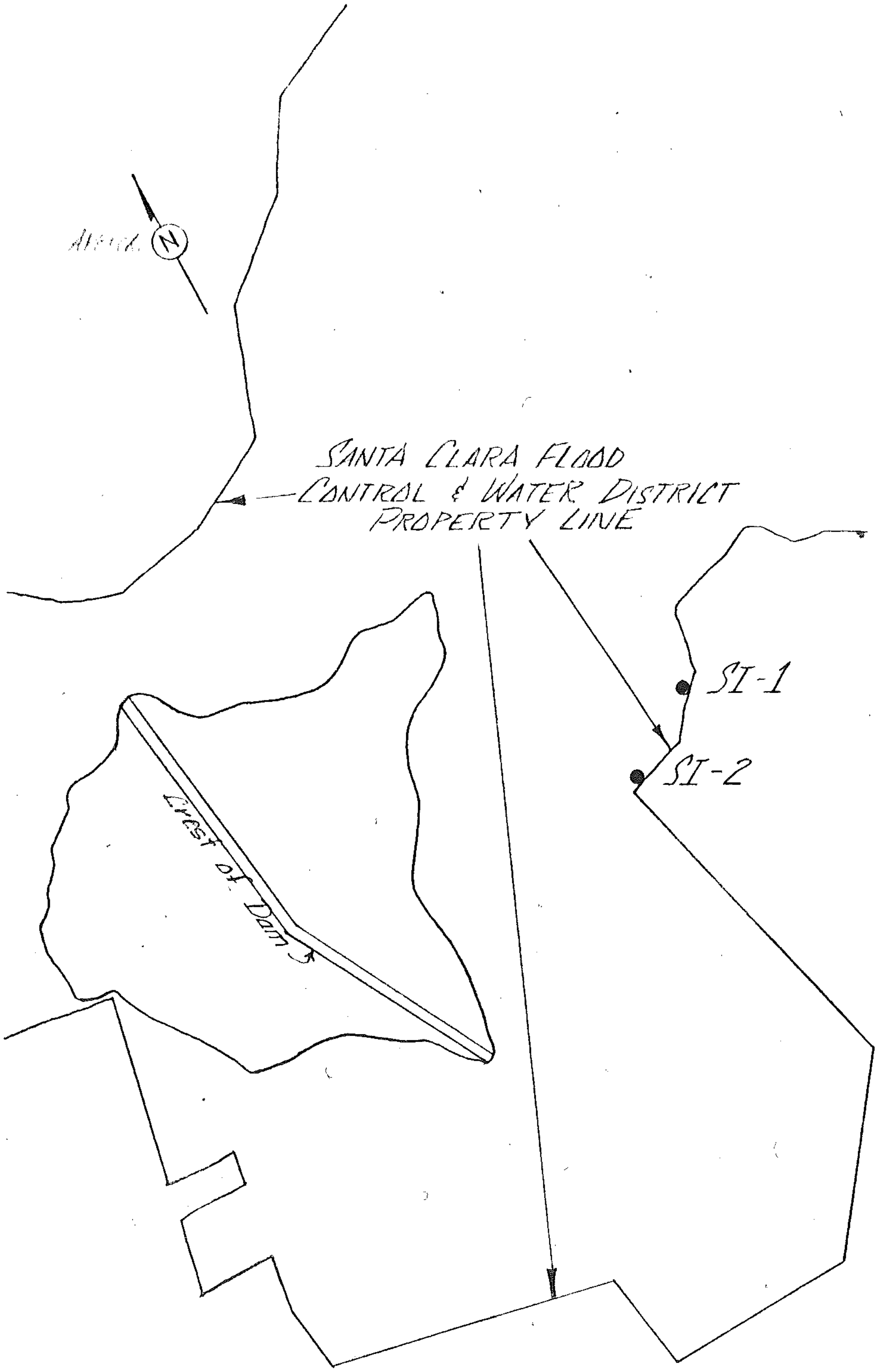
SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-2

Depth Ft.	Initial Diff.	E+	W-	Diff.	Change	Def'l. In.
1.0	7	570	536	34	27	.68
2.5	10	573	544	29	19	.56
4.0	7	573	544	29	22	.47
6.0	42	588	528	60	18	.34
8.0	42	588	528	60	18	.23
10.0	42	586	533	53	11	.12
12.0	42	580	536	44	2	.06
14.0	41	578	538	40	-1	.05
16.0	7	564	552	12	5	.05
18.0	3	562	554	8	5	.02
20.0	1	559	556	3	2	-.00
22.0	-2	556	561	-5	-3	-.01
24.0	-2	556	561	-5	-3	.00
26.0	1	557	558	-1	-2	.02
28.0	1	557	556	1		.03
30.0	1	559	558	1		.03
32.0		557	558	-1	-1	.03
34.0	-2	557	559	-2		.03
36.0	-28	544	571	-27	1	.03
38.0	-26	545	570	-25	1	.03
40.0	-21	547	568	-21		.02
42.0	-20	548	568	-20		.02
44.0	-18	548	567	-19	-1	.02
46.0	-11	554	562	-8	3	.03
48.0	-8	554	562	-8		.01
50.0	-8	553	562	-9	-1	.01
52.0	-5	556	561	-5		.02
54.0	-24	544	567	-23	1	.02
56.0	-20	547	567	-20		.01
58.0	-20	548	568	-20		.01
60.0	-19	549	567	-18	1	.01
62.0	-13	552	564	-12	1	.00
64.0	-16	551	565	-14	2	.00
66.0	-2	557	559	-2		-.00
68.0	-2	557	559	-2		-.00
70.0	-3	556	560	-4	-1	-.00
72.0	-3	556	560	-4	-1	-.00
74.0	-5	556	560	-4	1	.00

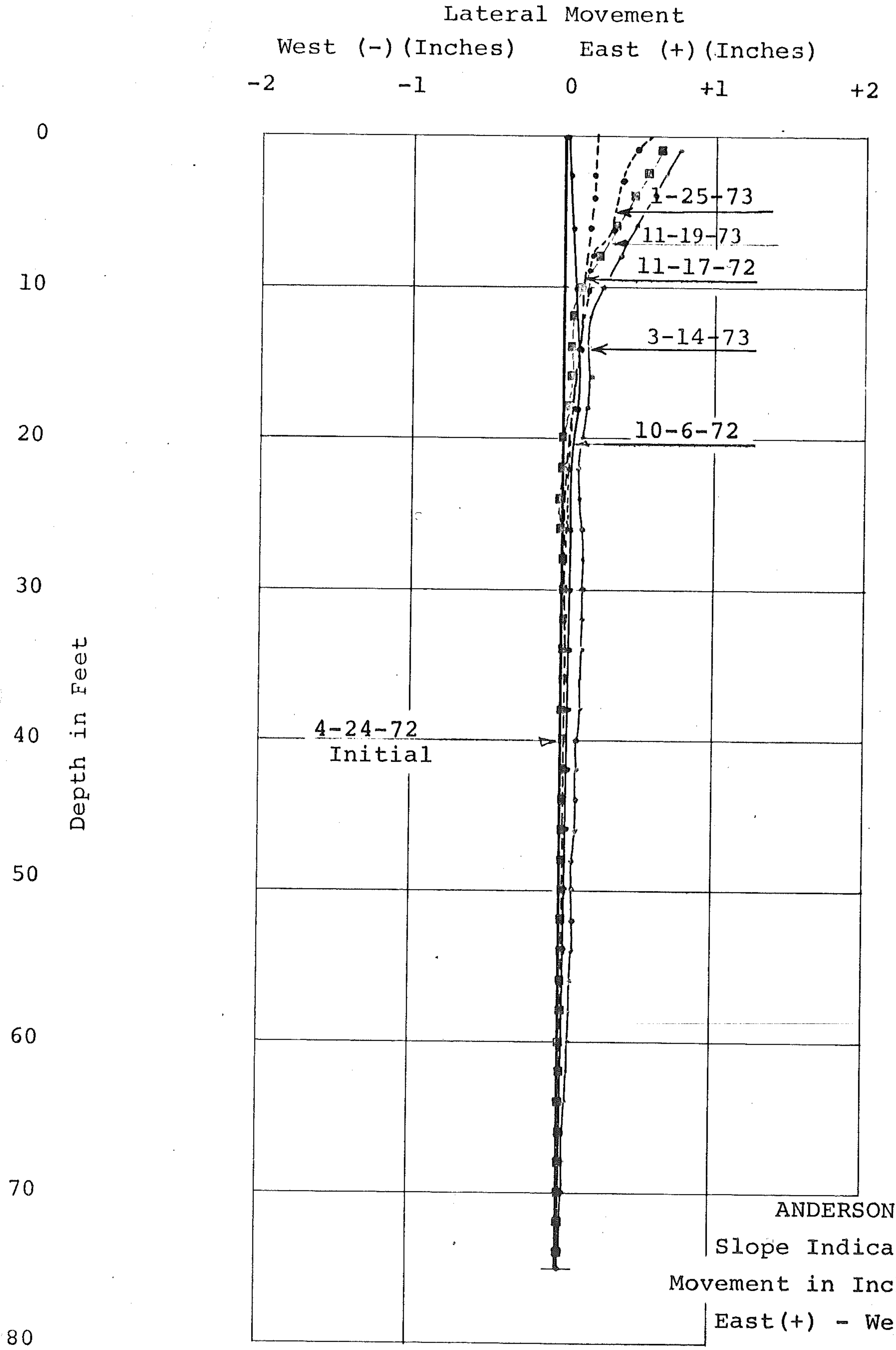


NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR
CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION
LOCATION SKETCH

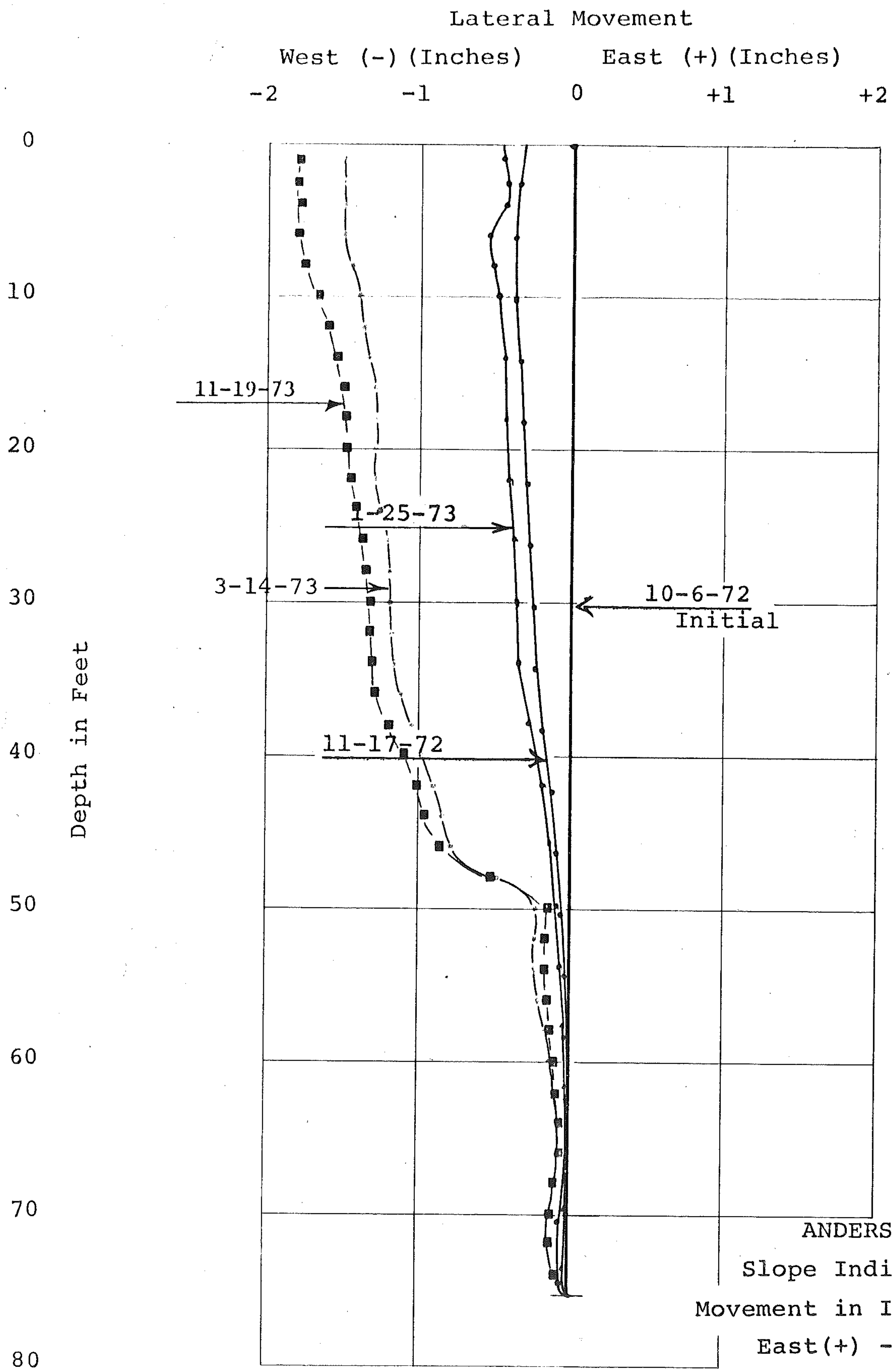
SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIG 1



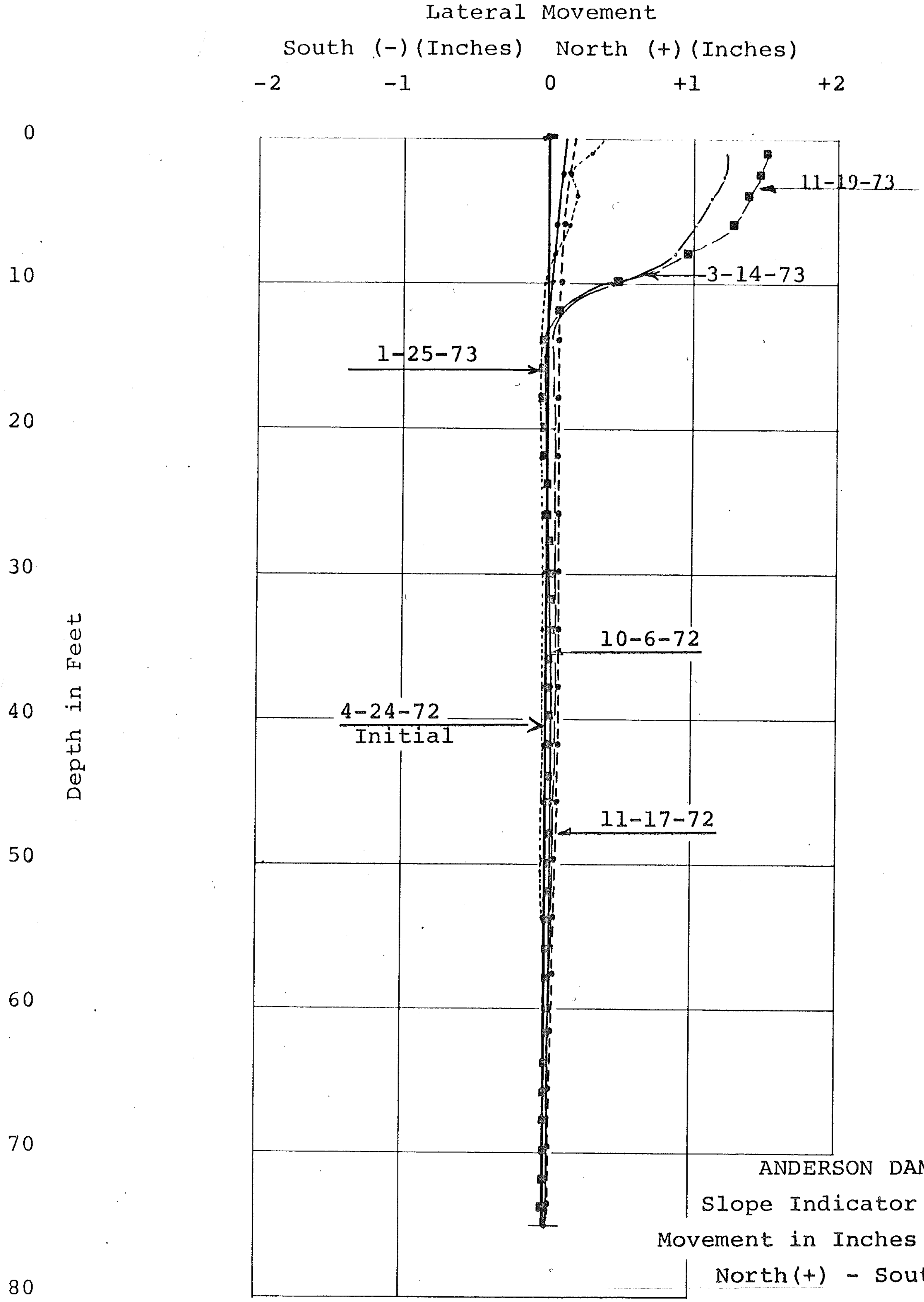
ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
East(+) - West(-)

FIG. 9



ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
East(+) - West(-)

FIG. 5



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
North(+) - South(-)

FIG. 8

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

March 20, 1973

Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine
Engineering Geologist

Re: Inclinometers
Anderson Dam

Gentlemen:

At your request, data for inclinometers SI-1A and SI-2 were obtained on March 14, 1973. The location of inclinometers is shown on Fig. 1. Plots of lateral movement versus depth are enclosed as Fig. 4, 5, 8, and 9. The calculator printout sheets are also enclosed.

The top of inclinometer SI-1A has moved in the order of eight and 1.5 inches in the north and west directions, respectively, since installation. Most of the movement occurs in a well developed shear zone about five feet thick at a depth of about 50 feet. No movements are indicated below 50 feet, although the data suggest a slight amount of movement below 50 feet in a westerly direction. This movement will be checked during the next set of readings.

The inclinometer SI-1A shows somewhat more movement than the survey data. The difference may be in the point of reference used. The survey data may be relative to the top of the protective cover in lieu of the plastic casing.

Significant additional movement over the five-foot thick shear zone may soon result in a buckled or sheared casing.

The top of inclinometer SI-2 indicates a 1.2 and 0.8 inches of total movement in the north and east directions, respectively. The movement is confined to the upper ten to 12 feet of hole. No movement is indicated below 12 feet.

The inclinometer data for SI-2 show somewhat more movement than the corresponding survey data. The difference may also lie in the reference points.

Water was observed at a depth of 14 feet in Casing SI-1A and at 27 feet in Casing SI-2.

Please advise if you have any questions or if you require further information.

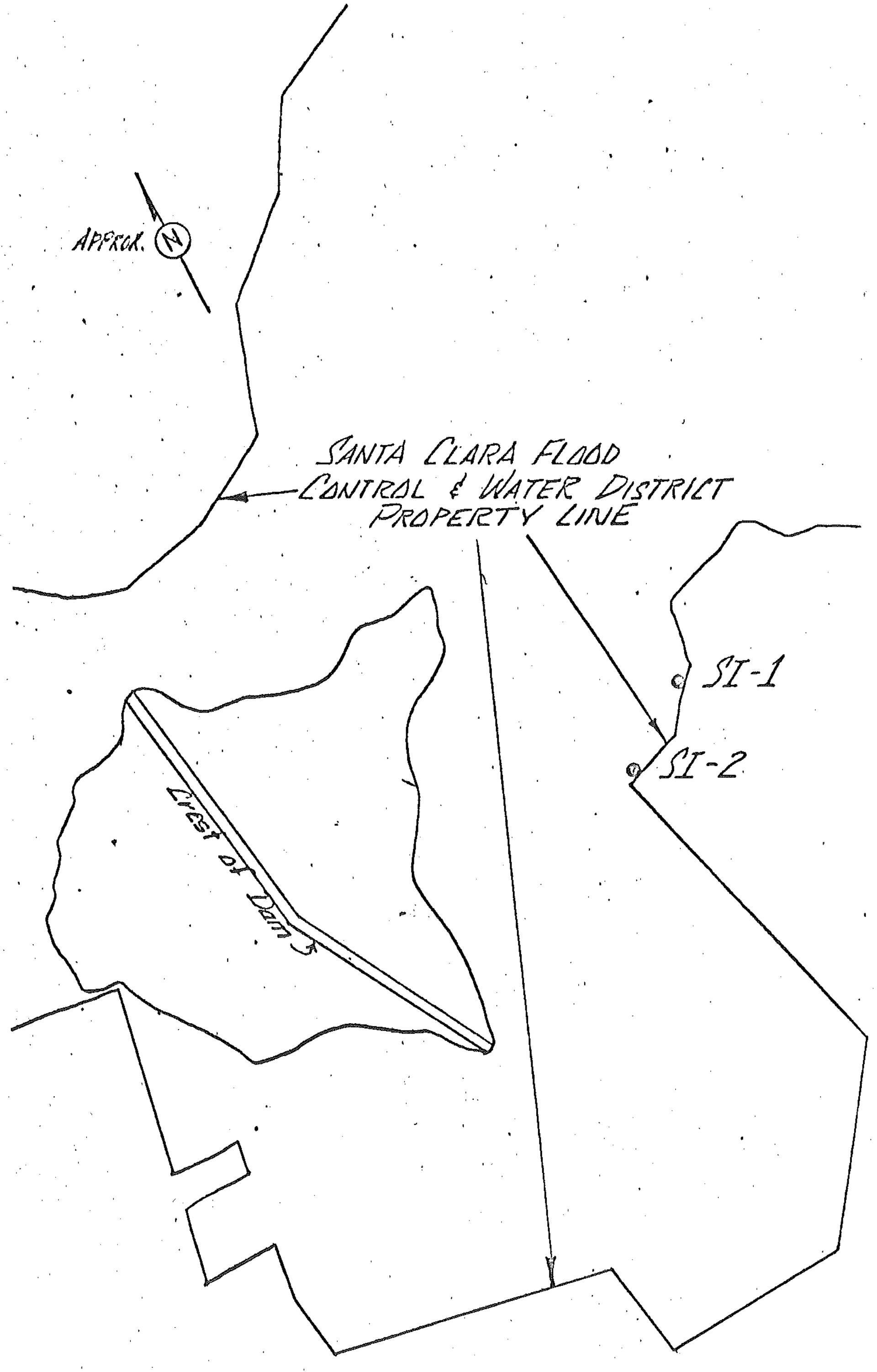
Very truly yours,

SHANNON & WILSON, INC.

By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

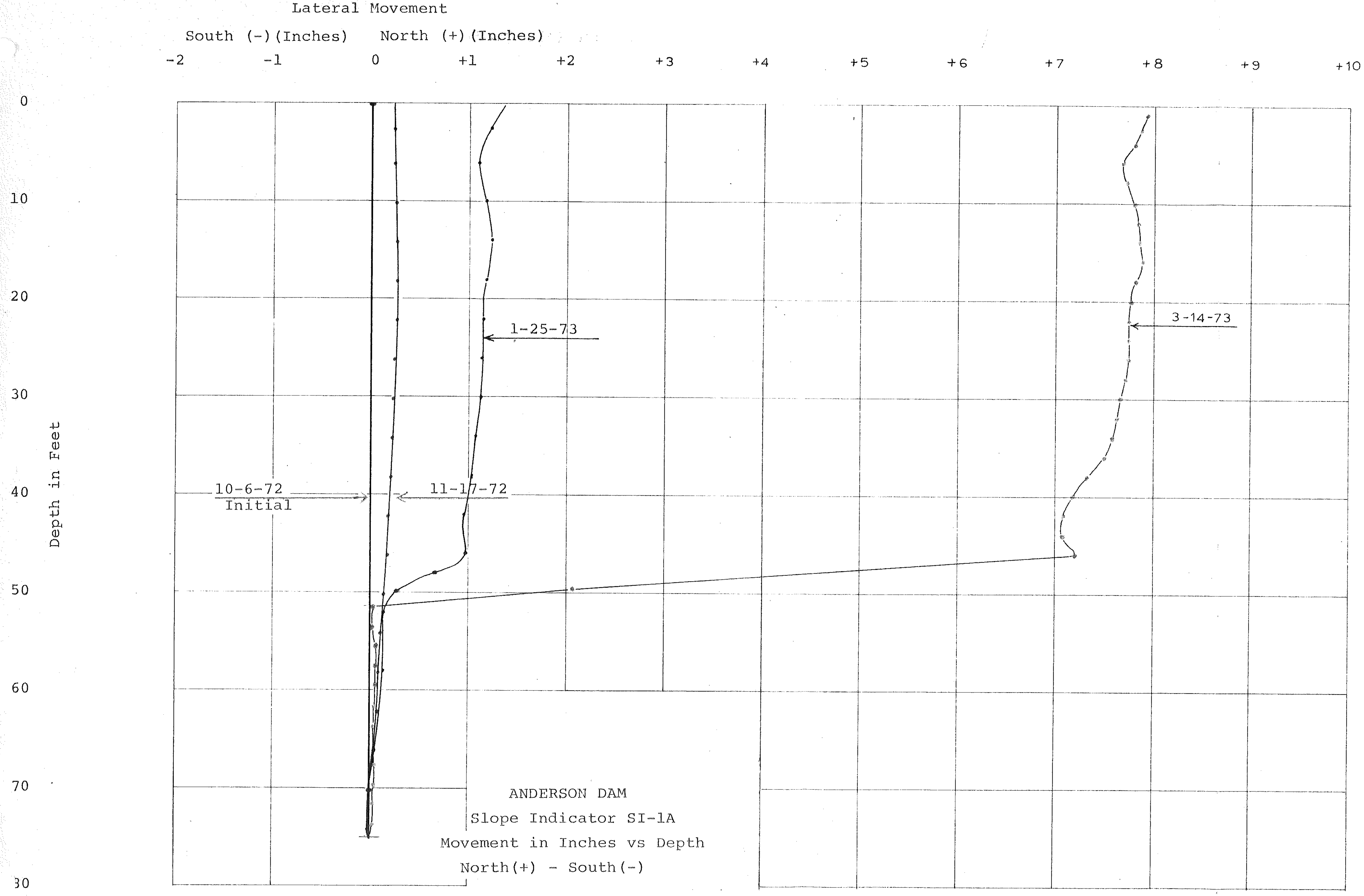
Enclosures: Figures 1, 4, 5, 8, and 9
Tables SI-1A and SI-2



NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR CASINGS ARE SCHEMATIC ONLY.

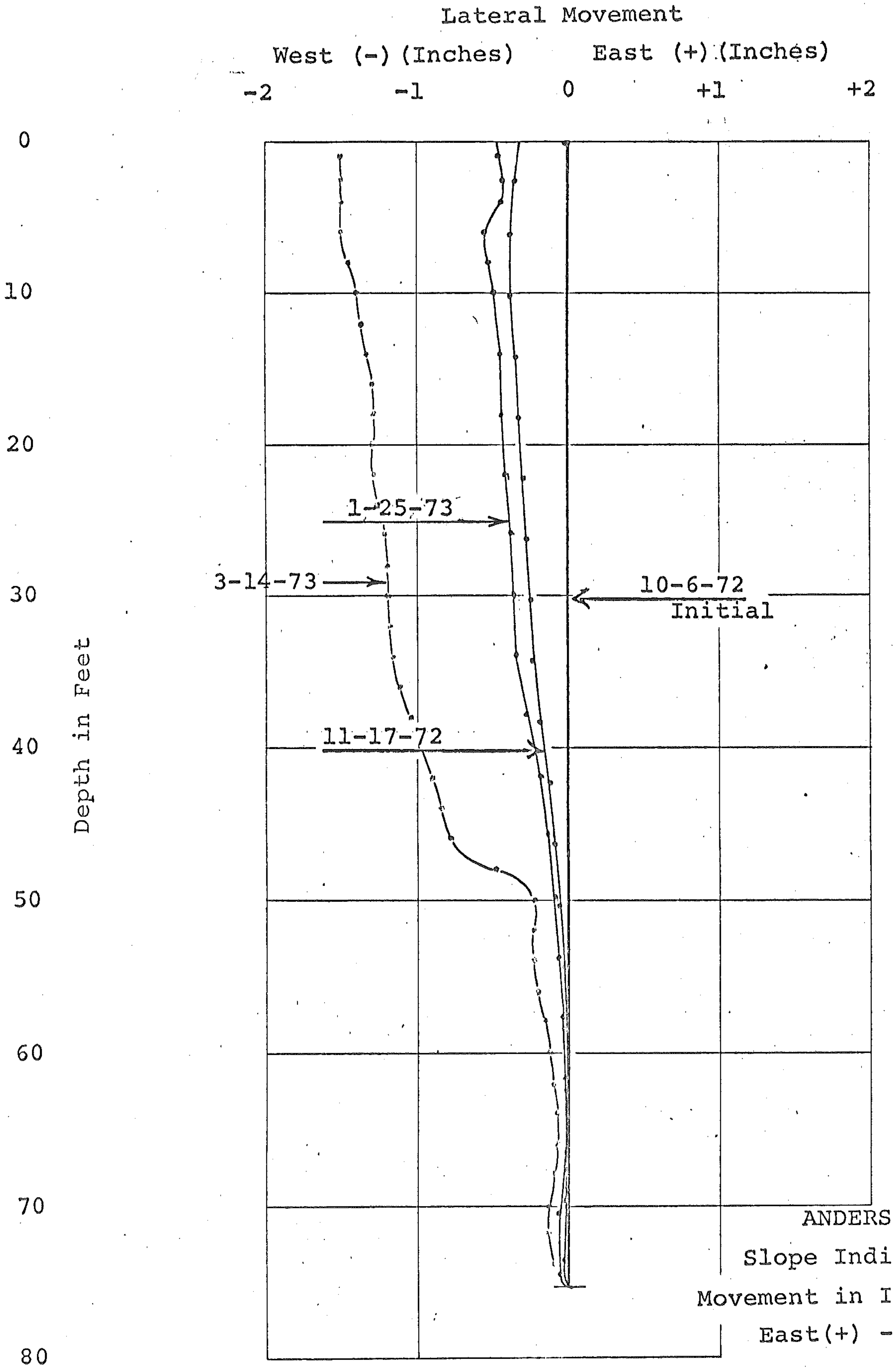
ANDERSON DAM
SLOPE INDICATOR INSTALLATION
LOCATION SKETCH

SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

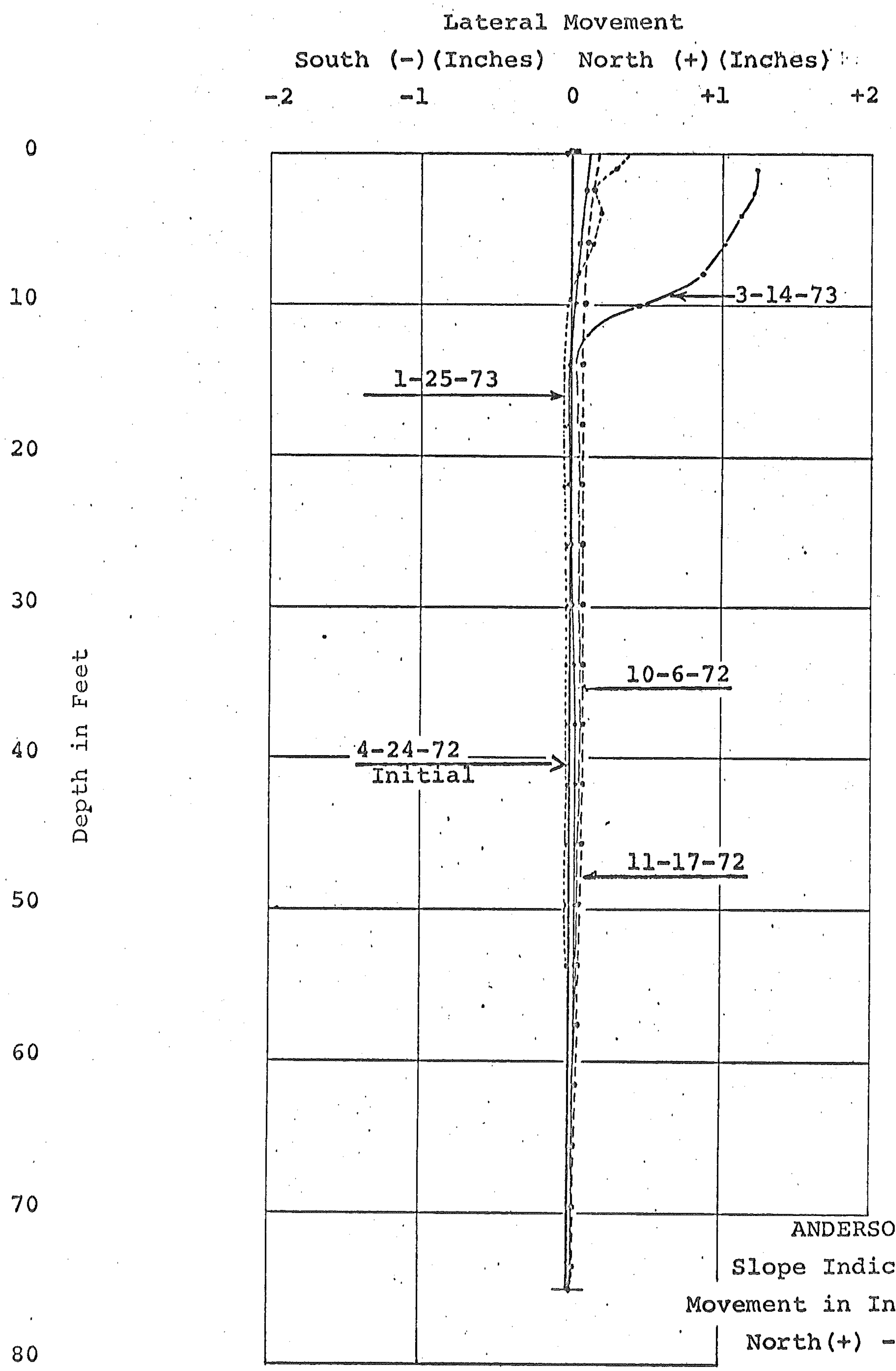


ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
North(+) - South(-)

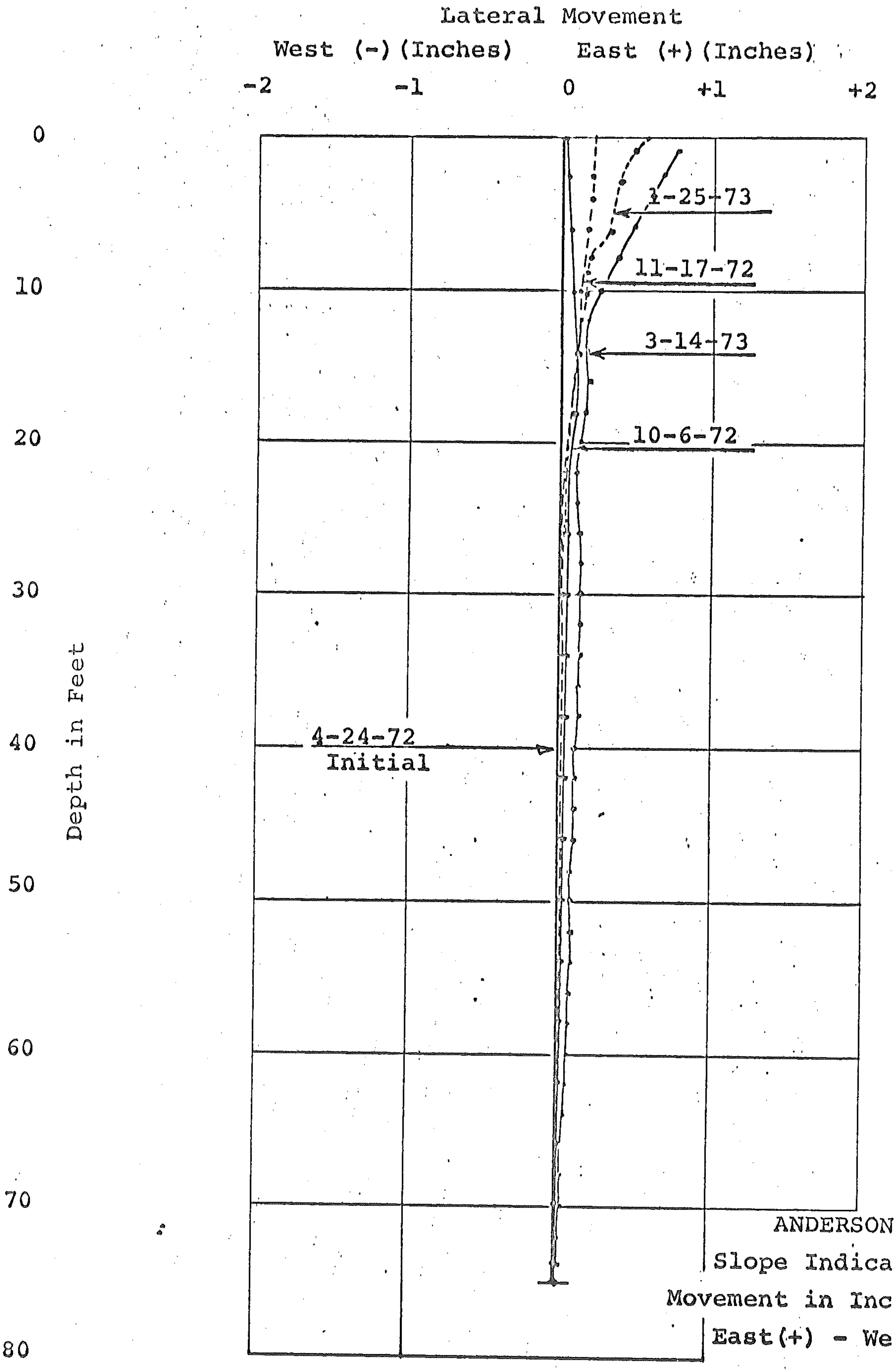
FIG. 4



ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
East(+) - West(-)



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
North(+) - South(-)



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
East(+) - West(-)

Sheet 1 of 4

Date of Readings 3-14-73

SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-1A

Depth Ft.	Initial Diff.	N+	S-	Diff.	Change	Def'l. In.
1.0	-86	523	591	-68	18	7.91
2.5	-82	524	590	-66	16	7.83
4.0	-81	526	589	-63	18	7.75
6.0	-134	485	630	-145	-11	7.65
8.0	-135	484	631	-147	-12	7.71
10.0	-136	486	628	-142	-6	7.78
12.0	-141	485	630	-145	-4	7.82
14.0	-145	481	631	-150	-5	7.84
16.0	-191	469	645	-176	15	7.87
18.0	-194	464	649	-185	9	7.78
20.0	-198	460	654	-194	4	7.73
22.0	-201	457	657	-200	1	7.71
24.0	-203	456	659	-203		7.70
26.0	-247	436	677	-241	6	7.70
28.0	-252	435	679	-244	8	7.66
30.0	-255	432	681	-249	6	7.62
32.0	-260	431	683	-252	8	7.58
34.0	-261	433	681	-248	13	7.53
36.0	-318	411	701	-290	28	7.45
38.0	-326	407	707	-300	26	7.29
40.0	-332	398	715	-317	15	7.13
42.0	-320	393	718	-325	-5	7.04
44.0	-311	393	723	-330	-19	7.07
46.0	-357	560	561	-1	356	7.18
48.0	-368	629	492	137	505	5.05
50.0	-371	431	465	-34	337	2.02
52.0	-373	372	742	-370	3	.00
54.0	-377	363	751	-388	-11	-.01
56.0	-396	359	752	-393	3	.04
58.0	-399	359	755	-396	3	.03
60.0	-401	355	757	-402	-1	.01
62.0	-402	355	759	-404	-2	.01
64.0	-404	355	757	-402	2	.03
66.0	-386	364	748	-384	2	.01
68.0	-388	364	750	-386	2	.00
70.0	-390	362	752	-390		-.00
72.0	-391	360	753	-393	-2	-.00
74.0	-393	361	753	-392	1	.00

Sheet 2 of 4

Date of Readings 3-14-73

SLOPE INDICATOR DATA
PROJECT: ANDERSON RESERVOIR
SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-1A

Depth Ft.	Initial Diff.	E+	W-	Diff.	Change	Def'l. In.
1.0	82	599	515	84	2	-1.47
2.5	85	599	514	85		-1.48
4.0	87	601	514	87		-1.48
6.0	169	636	476	160	-9	-1.48
8.0	175	640	473	167	-8	-1.42
10.0	177	642	472	170	-7	-1.38
12.0	177	642	471	171	-6	-1.33
14.0	177	642	471	171	-6	-1.30
16.0	175	645	469	176	1	-1.26
18.0	172	643	471	172		-1.27
20.0	169	639	473	166	-3	-1.27
22.0	165	637	477	160	-5	-1.25
24.0	163	635	479	156	-7	-1.22
26.0	113	612	501	111	-2	-1.18
28.0	107	608	504	104	-3	-1.17
30.0	103	608	506	102	-1	-1.15
32.0	98	604	510	94	-4	-1.14
34.0	91	600	514	86	-5	-1.12
36.0	78	590	525	65	-13	-1.09
38.0	74	588	526	62	-12	-1.01
40.0	72	588	527	61	-11	-.94
42.0	72	590	526	64	-8	-.87
44.0	81	590	521	69	-12	-.82
46.0	16	537	571	-34	-50	-.75
48.0	12	540	570	-30	-42	-.45
50.0	17	577	555	22	5	-.20
52.0	17	564	551	13	-4	-.23
54.0	9	559	556	3	-6	-.21
56.0	-33	540	579	-39	-6	-.17
58.0	-34	537	577	-40	-6	-.13
60.0	-37	537	578	-41	-4	-.10
62.0	-39	536	579	-43	-4	-.07
64.0	-40	538	577	-39	1	-.05
66.0	-85	519	596	-77	8	-.06
68.0	-87	516	599	-83	4	-.10
70.0	-89	512	602	-90	-1	-.13
72.0	-87	510	605	-95	-8	-.12
74.0	-86	508	607	-99	-13	-.07

Sheet 3 of 4

Date of Readings 3-14-73

SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-2

Depth Ft.	Initial Diff.	N+	S-	Diff.	Change	Def'l. In.
1.0	29	575	534	41	12	1.25
2.5	30	585	538	47	17	1.20
4.0	33	584	532	52	19	1.12
6.0	88	612	499	113	25	1.01
8.0	88	637	478	159	71	.86
10.0	88	630	483	147	59	.43
12.0	86	605	510	95	9	.08
14.0	87	598	516	82	-5	.03
16.0	47	581	534	47		.06
18.0	47	581	534	47		.06
20.0	47	580	535	45	-2	.06
22.0	47	581	534	47		.07
24.0	45	579	535	44	-1	.07
26.0	47	581	535	46	-1	.07
28.0	47	583	535	48	1	.08
30.0	58	585	528	57	-1	.07
32.0	54	585	529	56	2	.08
34.0	54	585	531	54		.07
36.0	65	590	525	65		.07
38.0	64	590	525	65	1	.07
40.0	64	589	525	64		.06
42.0	62	589	526	63	1	.06
44.0	63	588	526	62	-1	.06
46.0	64	590	525	65	1	.06
48.0	64	590	525	65	1	.06
50.0	67	591	524	67		.05
52.0	63	588	525	63		.05
54.0	61	590	527	63	2	.05
56.0	66	590	524	66		.04
58.0	65	590	524	66	1	.04
60.0	64	589	525	64		.03
62.0	61	588	526	62	1	.03
64.0	63	589	525	64	1	.03
66.0	40	579	535	44	4	.02
68.0	40	578	537	41	1	.00
70.0	46	580	534	46		-.00
72.0	46	580	535	45	-1	-.00
74.0	44	580	536	44		.00

Sheet 4 of 4

Date of Readings 3-14-73

SLOPE INDICATOR DATA

PROJECT: ANDERSON RESERVOIR

SANTA CLARA COUNTY FLOOD CONTROL & WATER DISTRICT

OBSERVATION WELL NO. SI-2

Depth Ft.	Initial Diff.	E+	W-	Diff.	Change	Def'l. In.
1.0	7	567	537	30	23	.77
2.5	10	569	543	26	16	.67
4.0	7	571	545	26	19	.60
6.0	42	588	528	60	18	.48
8.0	42	588	526	62	20	.37
10.0	42	586	531	55	13	.25
12.0	42	579	536	43	1	.18
14.0	41	576	538	38	-3	.17
16.0	7	564	551	13	6	.19
18.0	3	561	553	8	5	.15
20.0	1	559	555	4	3	.12
22.0	-2	556	559	-3	-1	.10
24.0	-2	555	559	-4	-2	.11
26.0	1	557	557		-1	.12
28.0	1	557	556	1		.13
30.0	1	559	558	1		.13
32.0		557	557			.13
34.0	-2	557	558	-1	1	.13
36.0	-28	544	571	-27	1	.12
38.0	-26	545	569	-24	2	.12
40.0	-21	547	568	-21		.10
42.0	-20	548	567	-19	1	.10
44.0	-18	548	566	-18		.10
46.0	-11	554	562	-8	3	.10
48.0	-8	554	562	-8		.08
50.0	-8	553	562	-9	-1	.08
52.0	-5	555	560	-5		.09
54.0	-24	544	567	-23	1	.09
56.0	-20	548	566	-18	2	.08
58.0	-20	548	567	-19	1	.07
60.0	-19	549	566	-17	2	.06
62.0	-13	552	563	-11	2	.05
64.0	-16	551	564	-13	3	.04
66.0	-2	556	559	-3	-1	.02
68.0	-2	557	558	-1	1	.03
70.0	-3	557	559	-2	1	.02
72.0	-3	557	559	-2	1	.01
74.0	-5	556	559	-3	2	.01

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

February 2, 1973

Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine

Re: Slope Indicators
Anderson Dam

Gentlemen:

This letter presents the results of a recent survey of Slope Indicator casings, SI-1A and SI-2, located on the large slide area immediately northeast of the left abutment of Anderson Dam, Santa Clara County, California. This work was authorized by Mr. James Vantine and was performed under Purchase Order No. 3755.

The readings were obtained on January 25, 1973. A series 200B Slope Indicator instrument was used, and readings were obtained at two-foot increments of depth; plots of dial differences versus depth and actual deflection in inches versus depth are included for each set of grooves in the two installations. All plots are referenced to the initial readings for each casing. Field data sheets showing actual dial readings and summary sheets listing the casing deflection in inches for every four feet of depth are on file in our office.

SI-1A shows movement in the order of 0.7 inches in the north (downslope) direction at the 46 to 50-foot depth interval (Fig. 4). This type of movement is characteristic of a shear zone. The casing also has a minor component of movement in a westerly direction (Fig. 5). Movement at the surface is in the order of one inch with the top of the casing deflected in a north-northwesterly direction. SI-2 shows no discernible movement at depth (Fig. 8 and 9). Some deflection of the casing can be observed near the surface in an easterly direction. The apparent movement at the surface is in the order of 0.4 inches.

The movement observed at the 46 to 50-foot depth interval in SI-1A is probably indicative of a shear plane. Future Slope Indicator readings in this zone should be taken every six inches to further define the movement. No trend of movement can be established for SI-2 at this time.

We recommend that the District continue the combination of surface survey measurements and downhole readings of the Slope Indicator casings. Surface survey measurements should be obtained early in February and again early in March. It is requested that these data be made available for our review. Slope Indicator readings should be taken early in March and compared with the surface survey measurements. If the surface measurements indicate that significant movements are occurring, Slope Indicator readings should be obtained prior to the recommended reading in March.

Please advise if you have any questions or require further information.

Very truly yours,

SHANNON & WILSON, INC.

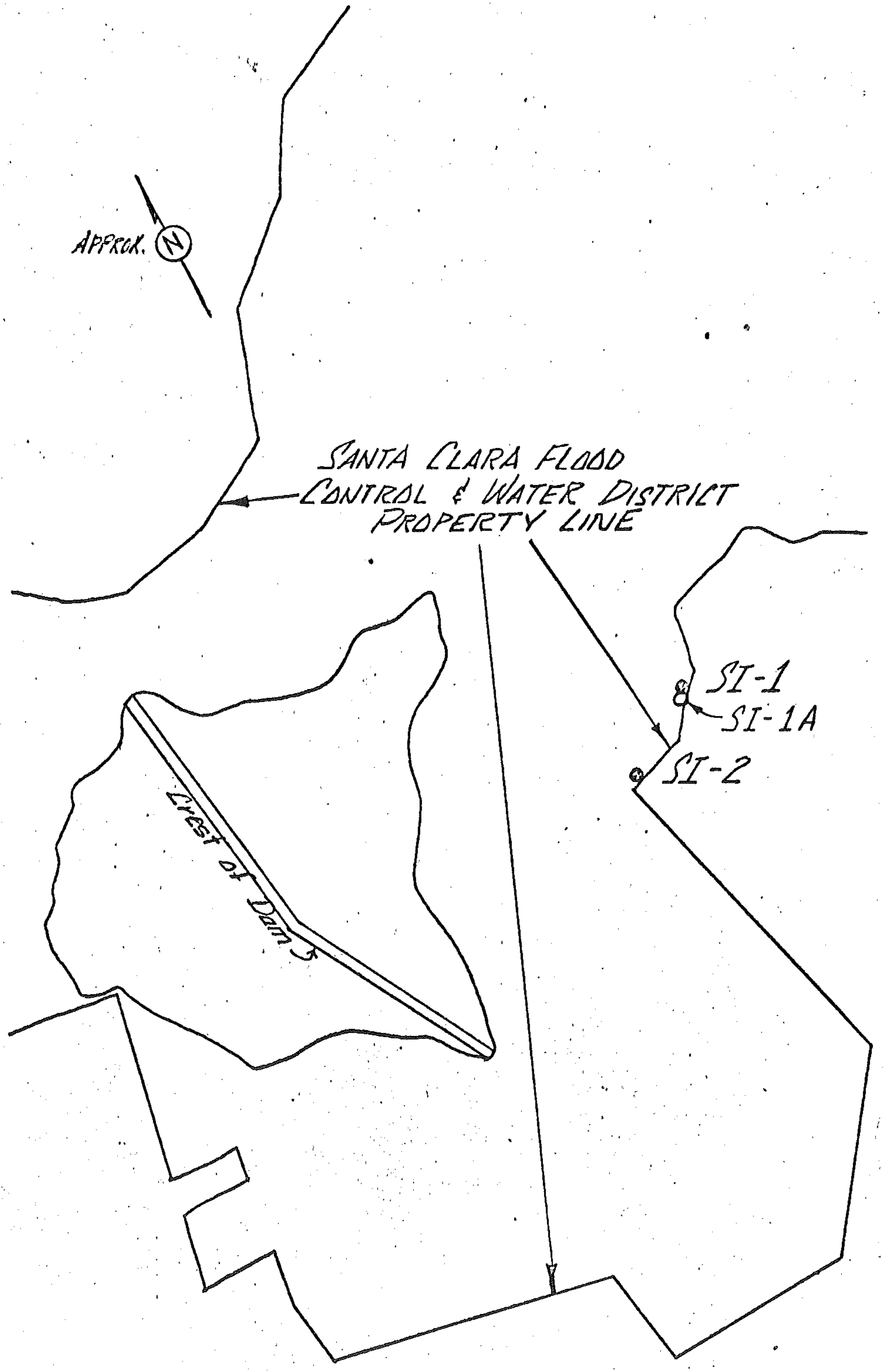
By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

Enclosures: Slope Indicator Plots

S.C.C.F.C. & W.D.

'73 FEB 5 PM 1:36



REVISED 10-13-72 TO SHOW
SI-1A

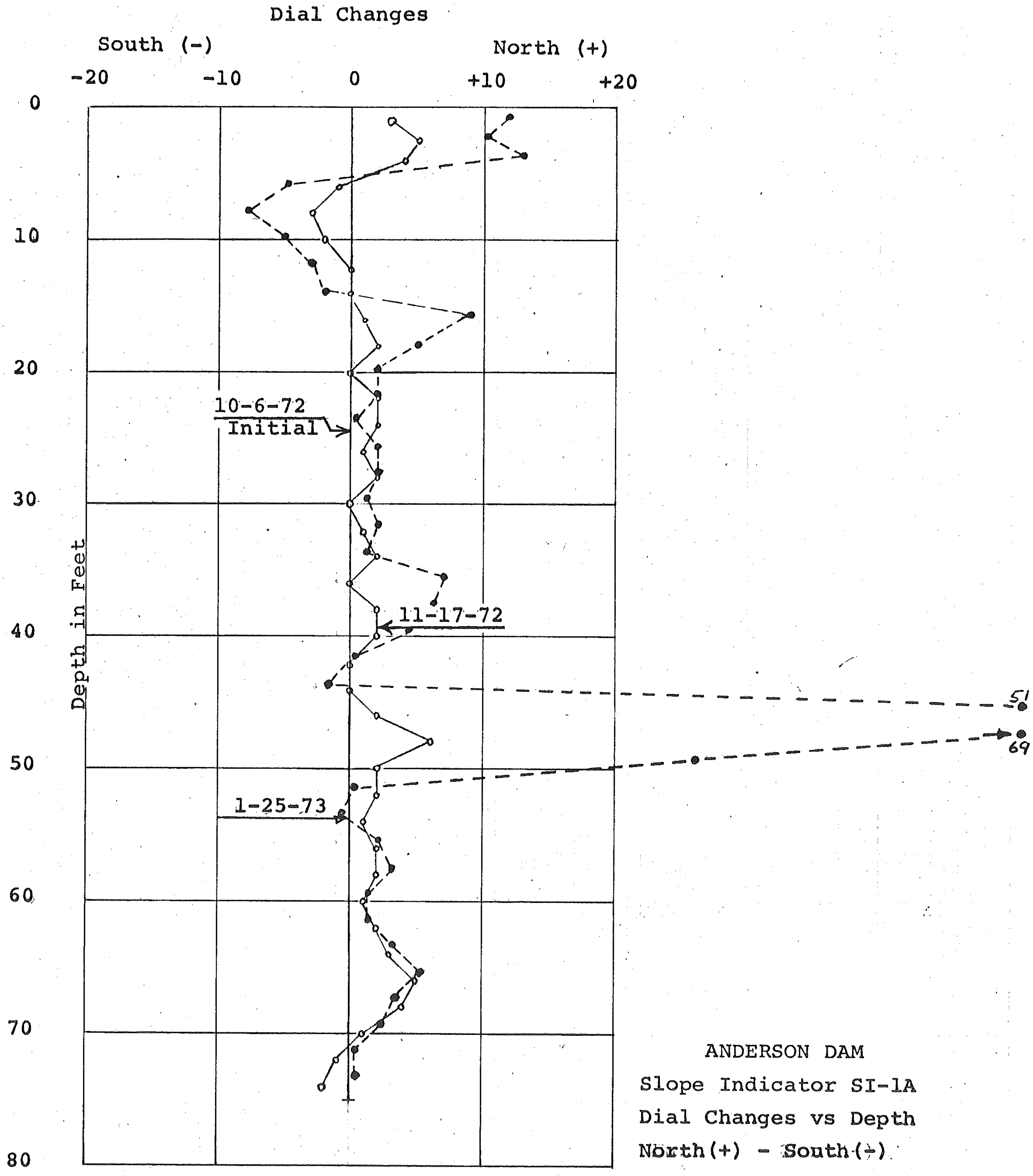
NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR
CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION

LOCATION SKETCH

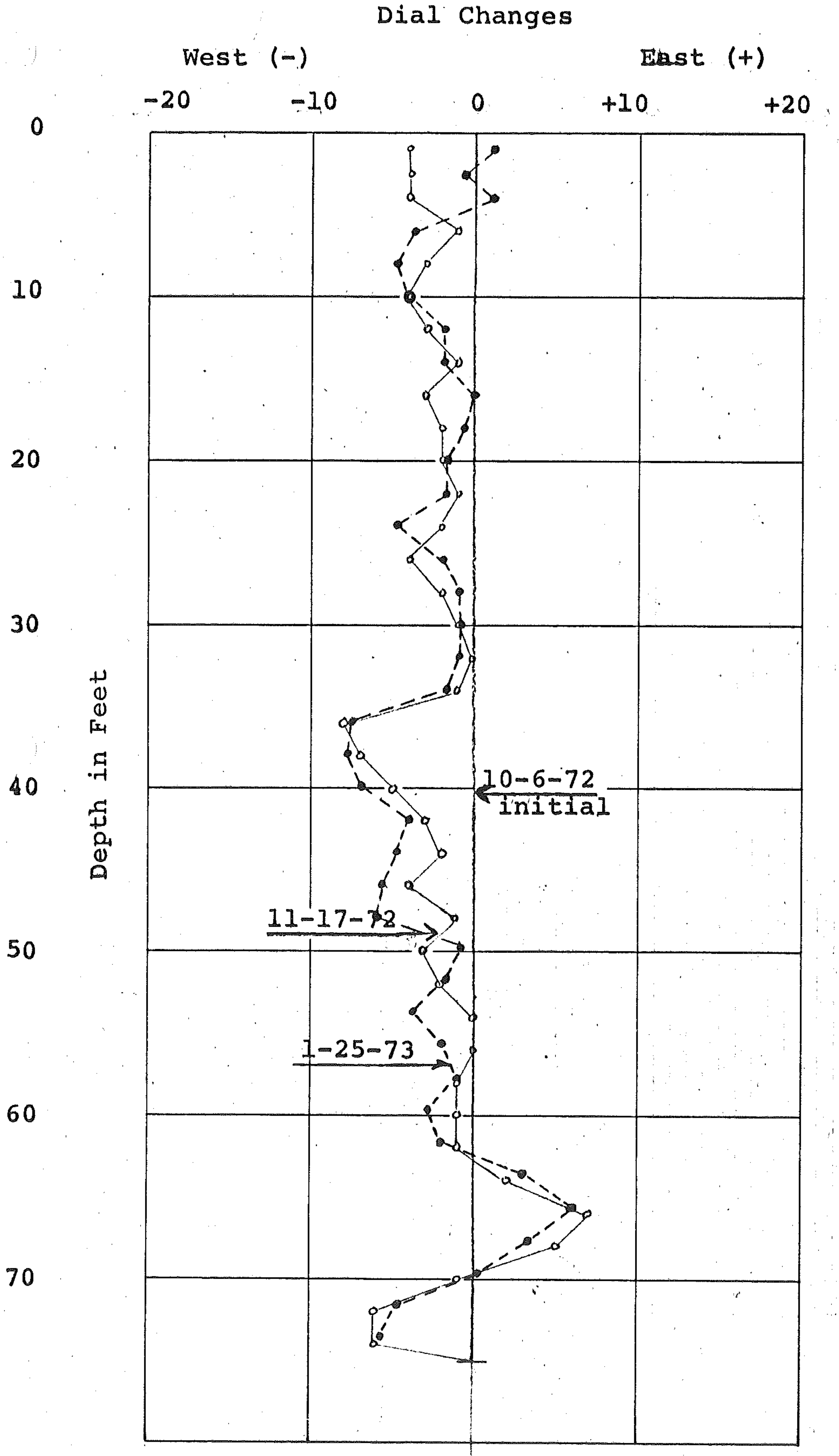
SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIG. 1



ANDERSON DAM
Slope Indicator SI-1A
Dial Changes vs Depth
North(+) - South(-)

FIG. 2



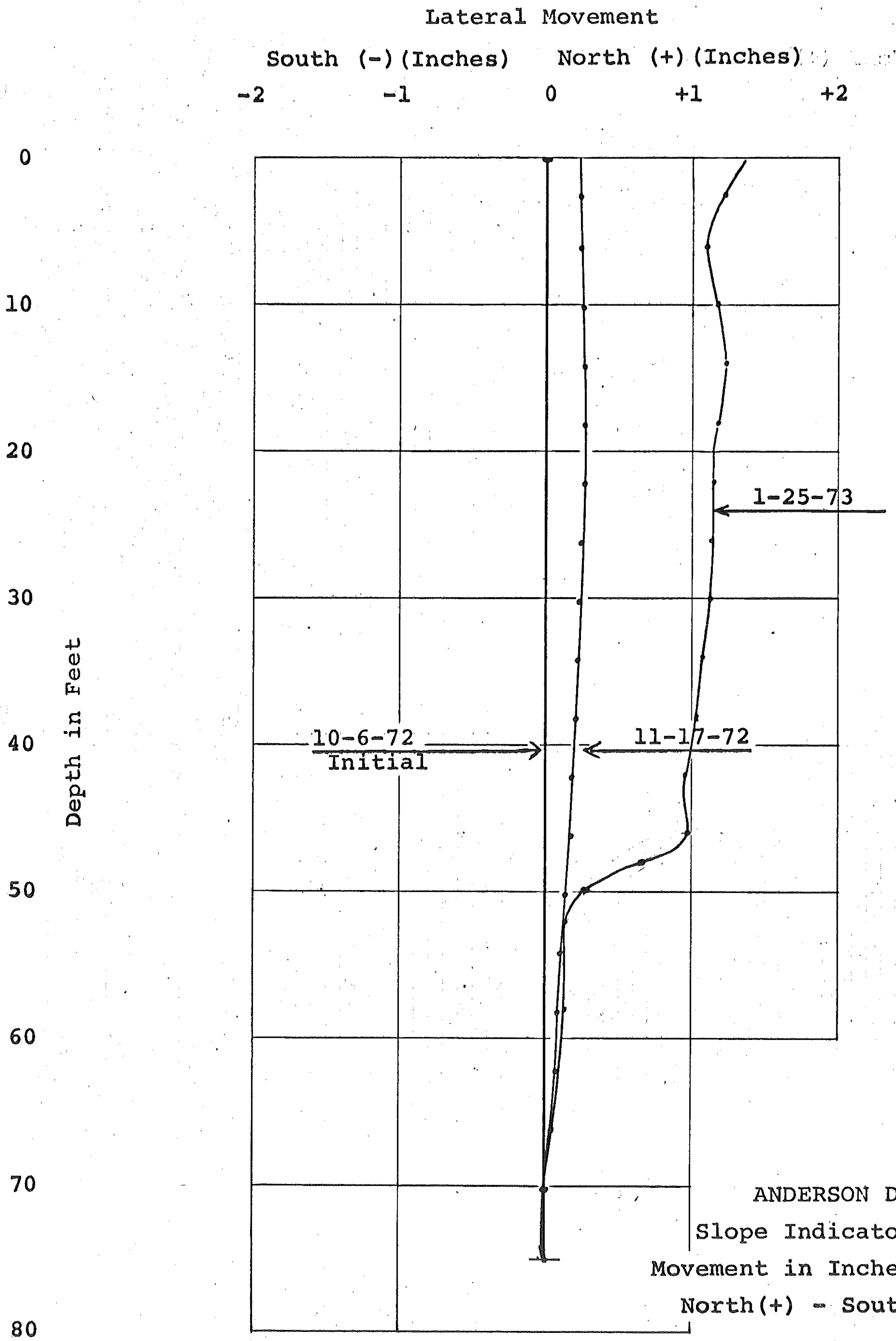
ANDERSON DAM

Slope Indicator SI-1A

Dial Changes vs Depth

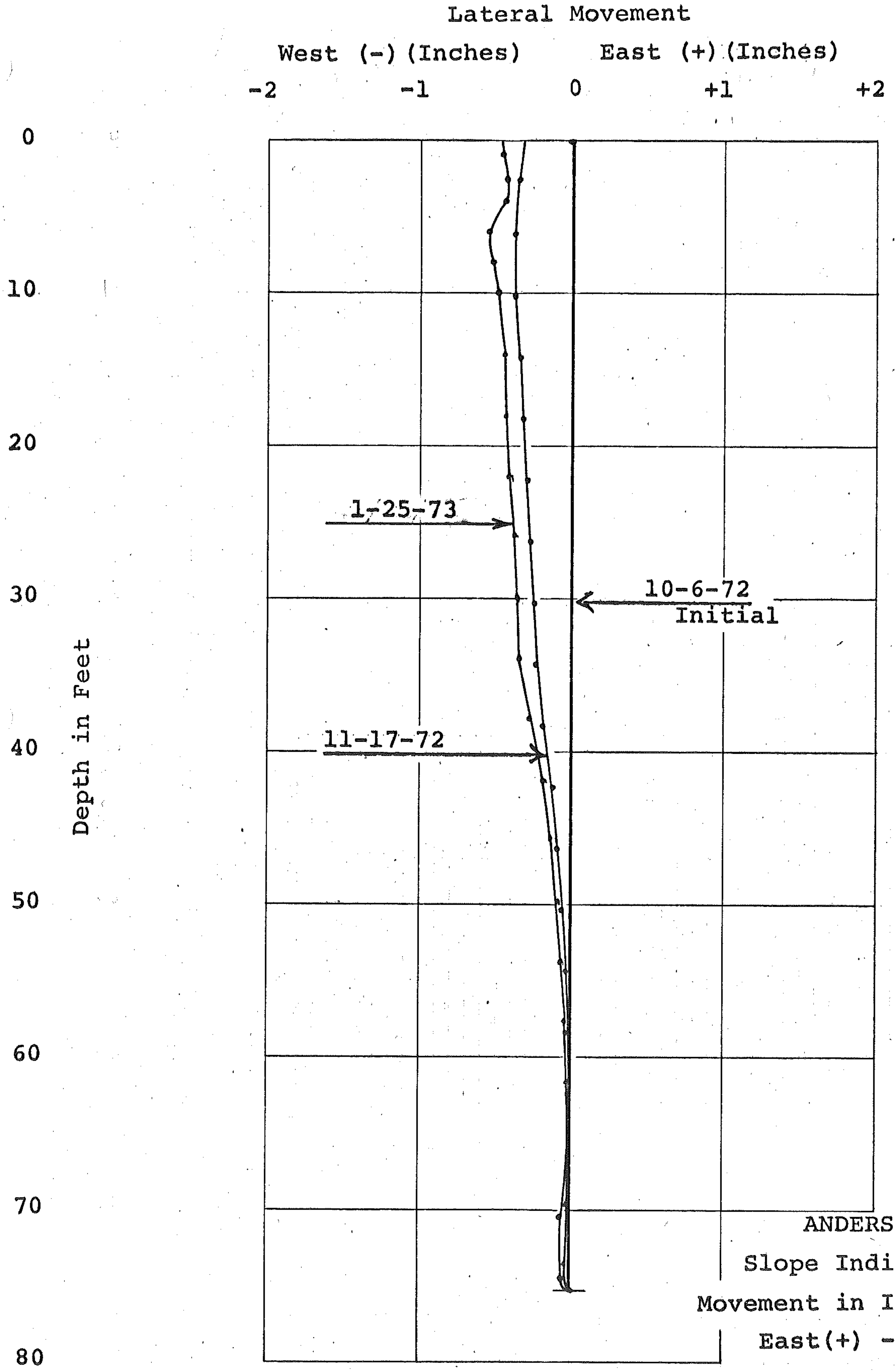
East (+) - West (-)

FIG. 3



ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
North(+) - South(-)

FIG. 4



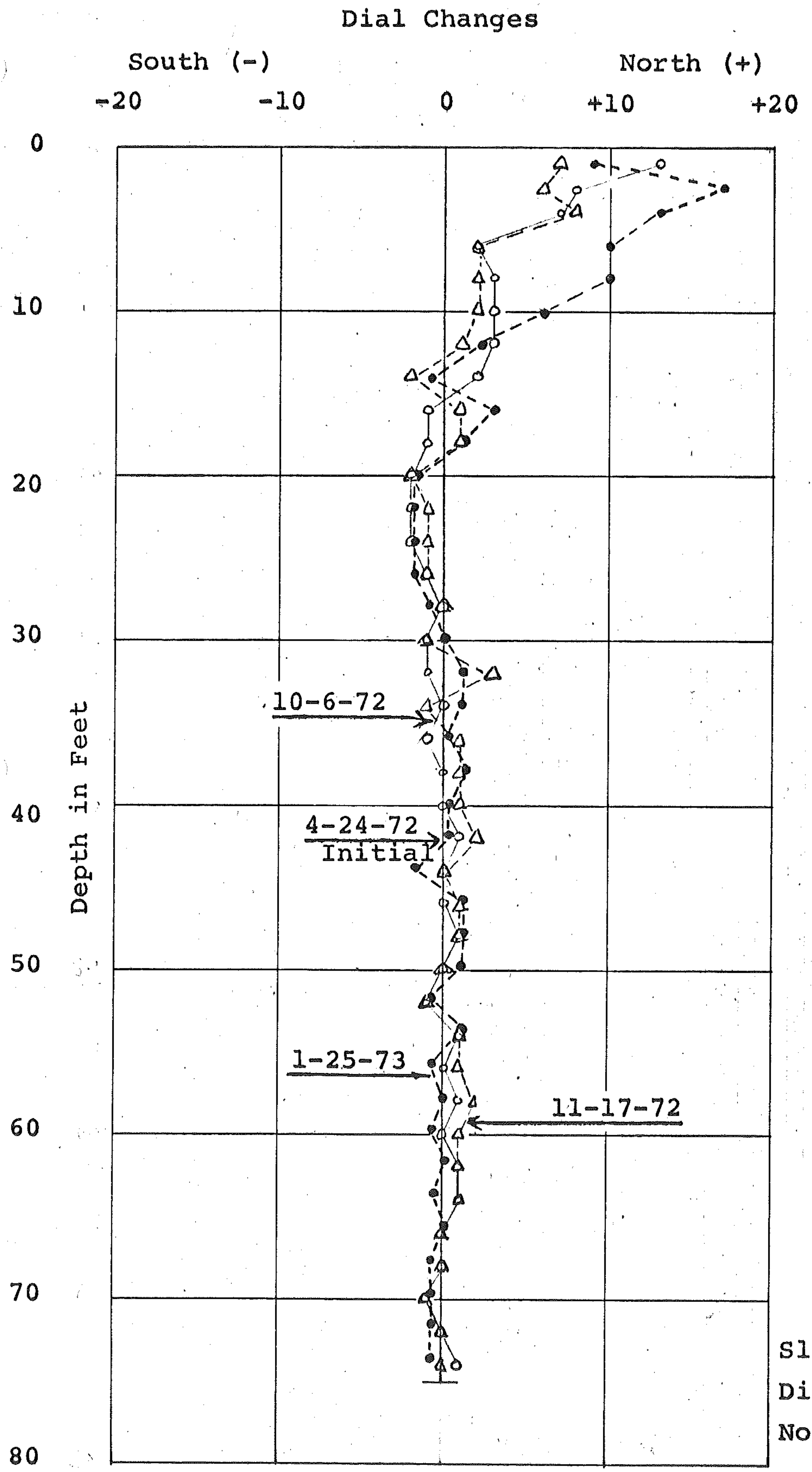
ANDERSON DAM

Slope Indicator SI-1A

Movement in Inches vs Depth

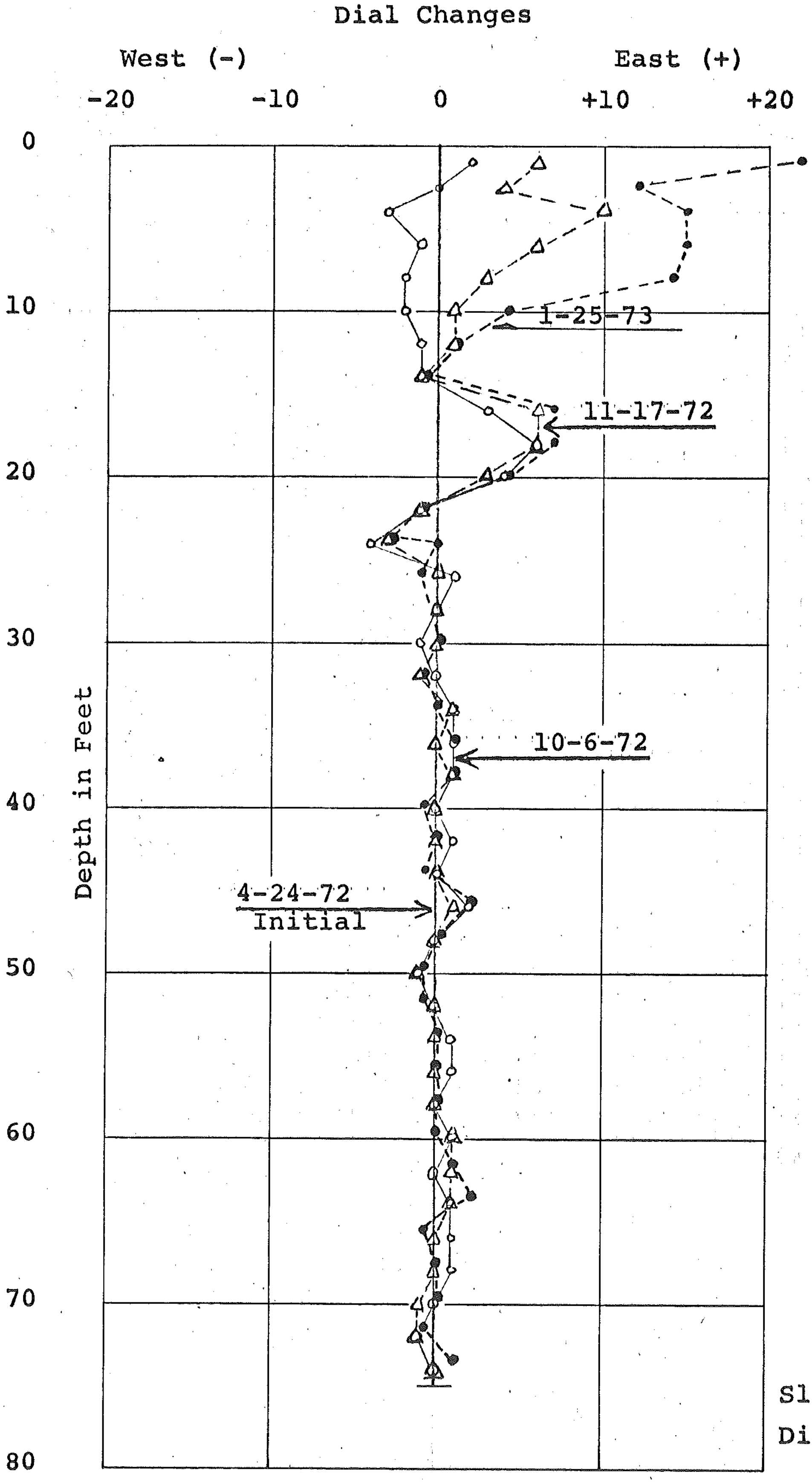
East(+) - West(-)

FIG. 5



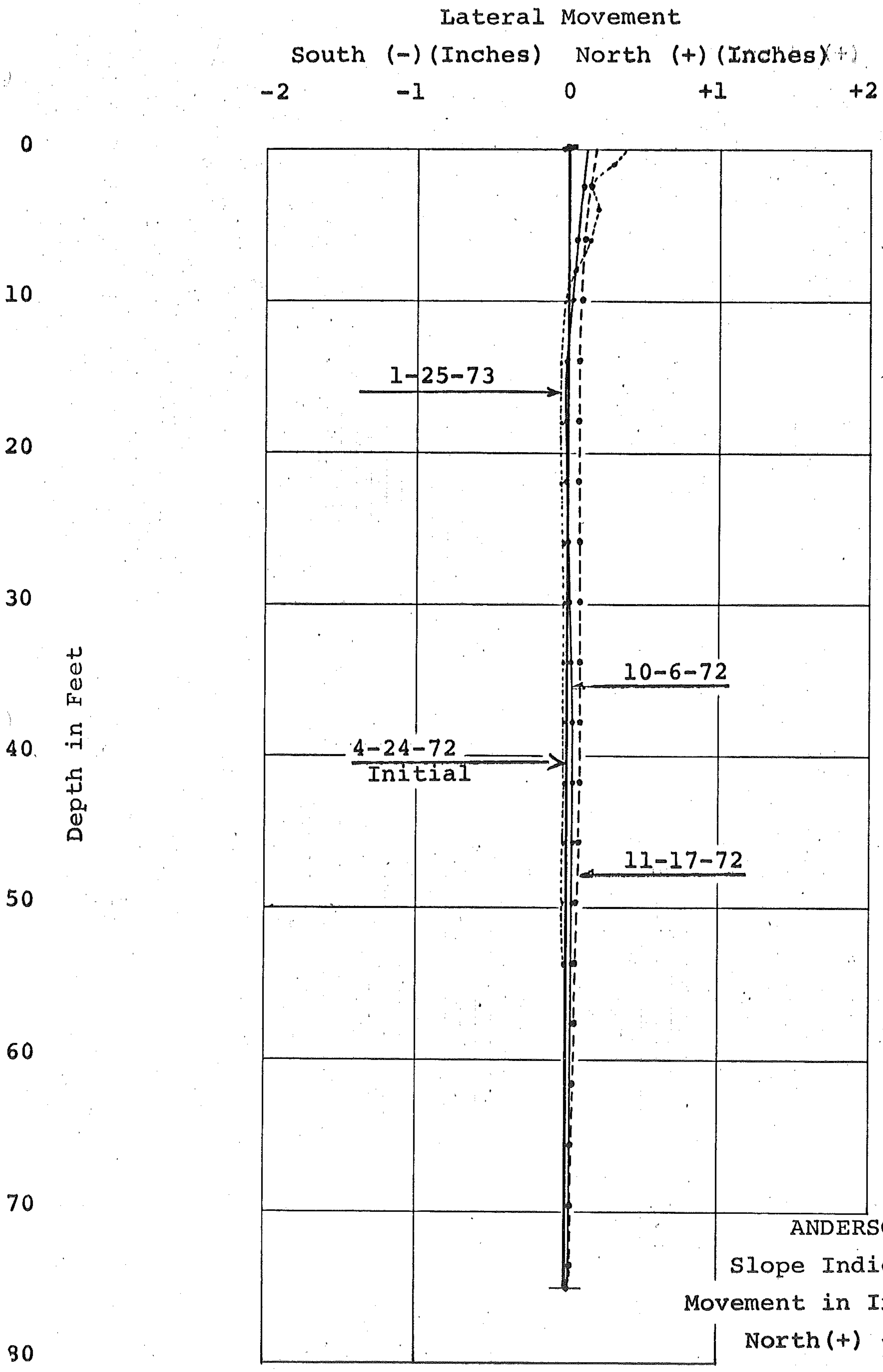
ANDERSON DAM
Slope Indicator SI-2
Dial Changes vs Depth
North(+) - South(-)

FIG. 6



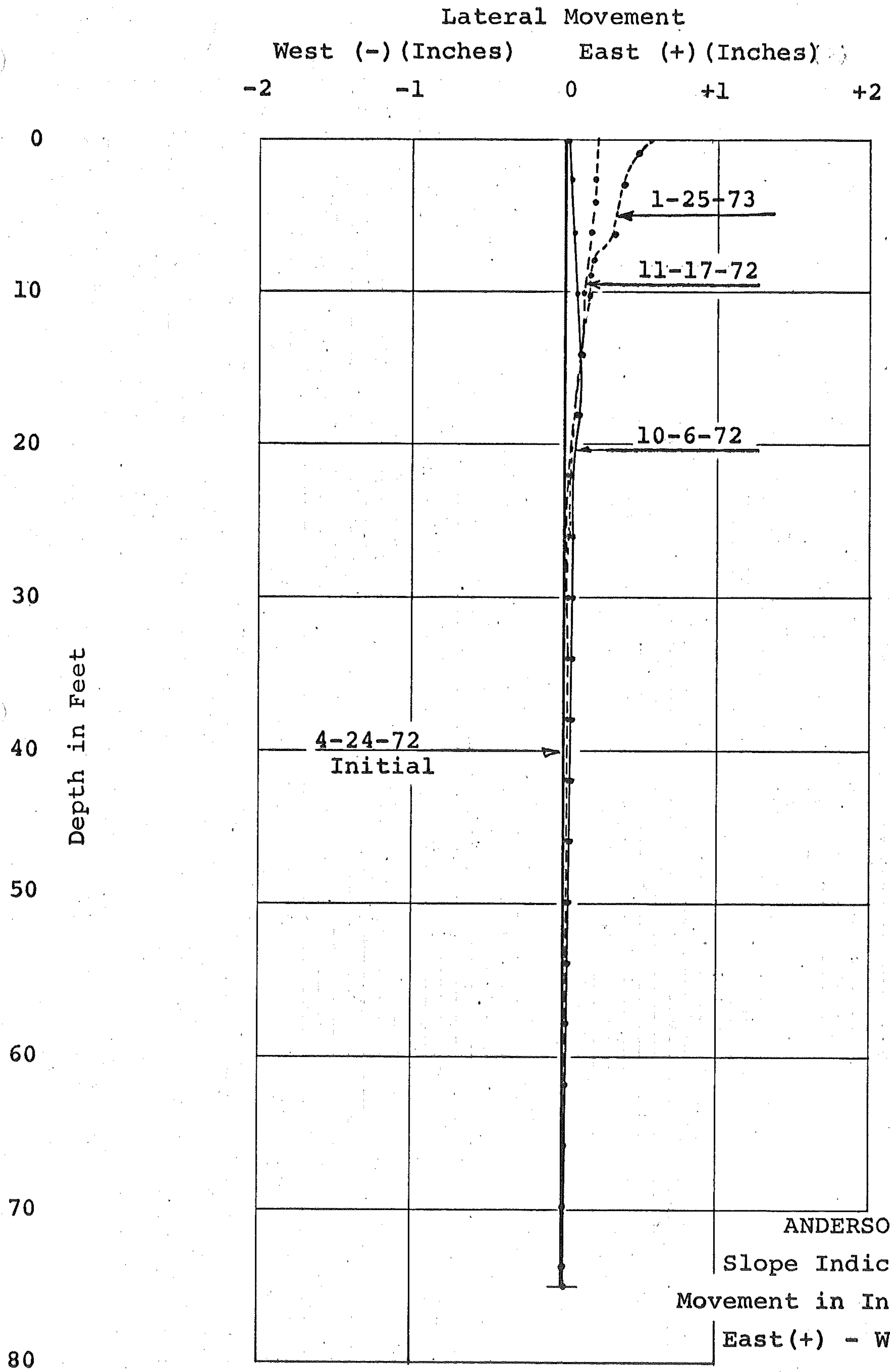
ANDERSON DAM
Slope Indicator SI-2
Dial Changes vs Depth
East(+) - West(-)

FIG. 7



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
North(+) - South(-)

FIG. 8



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
East(+) - West(-)

FIG. 9

S.C.C.F.C. & W.D.

'73 FEB 5 PM 1:36

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

November 30, 1972

Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine

Re: Slope Indicators
Anderson Dam

Gentlemen:

This letter presents the results of a recent survey of Slope Indicator casing SI-1A and SI-2 located on the large slide area immediately northeast of the left abutment of Anderson Dam, Santa Clara County, California. This work was authorized by Mr. James Vantine on November 16, 1972, and was performed under Purchase Order No. 3755.

The readings were obtained on November 17, 1972. A Series 200-B Slope Indicator instrument was used, and readings were obtained at two-foot increments of depth. Field data sheets showing actual dial readings are included for your information. Also included are summary sheets listing the casing deflection in inches for every four feet of depth. In addition, plots of dial differences versus depth and actual deflection in inches versus depth are included for each set of grooves in the two installations. All plots are referenced to the initial readings for each casing.

SI-1A shows some movement with the top of the casing deflected in the northwest direction. The movement at the surface is in the order of 0.5 inches and appears to be rather uniformly increasing from the bottom to the top. No definite shear plane can be defined. It is possible that the deflections plotted are the result of casing re-adjustment or instrument error. Additional data will be required to verify movement trends at this location.

SI-2 shows no discernible movement at depth. Some deflection of the casing is present near the surface, and this is probably caused by recent truck traffic along the access road to SI-1A. The movement at the surface is in the order of 0.2 inch.

Definite trends and rates of movement have not been established for either installation, although some movement may be occurring at SI-1A. We understand that the District has made a surface survey of the slide area and determined locations for the tops of the Slope Indicator casings. We, therefore, recommend a combination of surface survey measurements and downhole readings of the Slope Indicator casings. Surface survey measurements should be obtained early in December and again early in January. It is requested that these data be made available for our review. Slope Indicator readings should be taken early in January and compared with the surface survey measurements. If the surface measurements indicate that movements are occurring, Slope Indicator readings should be obtained prior to the recommended reading in January.

Please advise if you have any questions or require further information.

Very truly yours,

SHANNON & WILSON, INC.

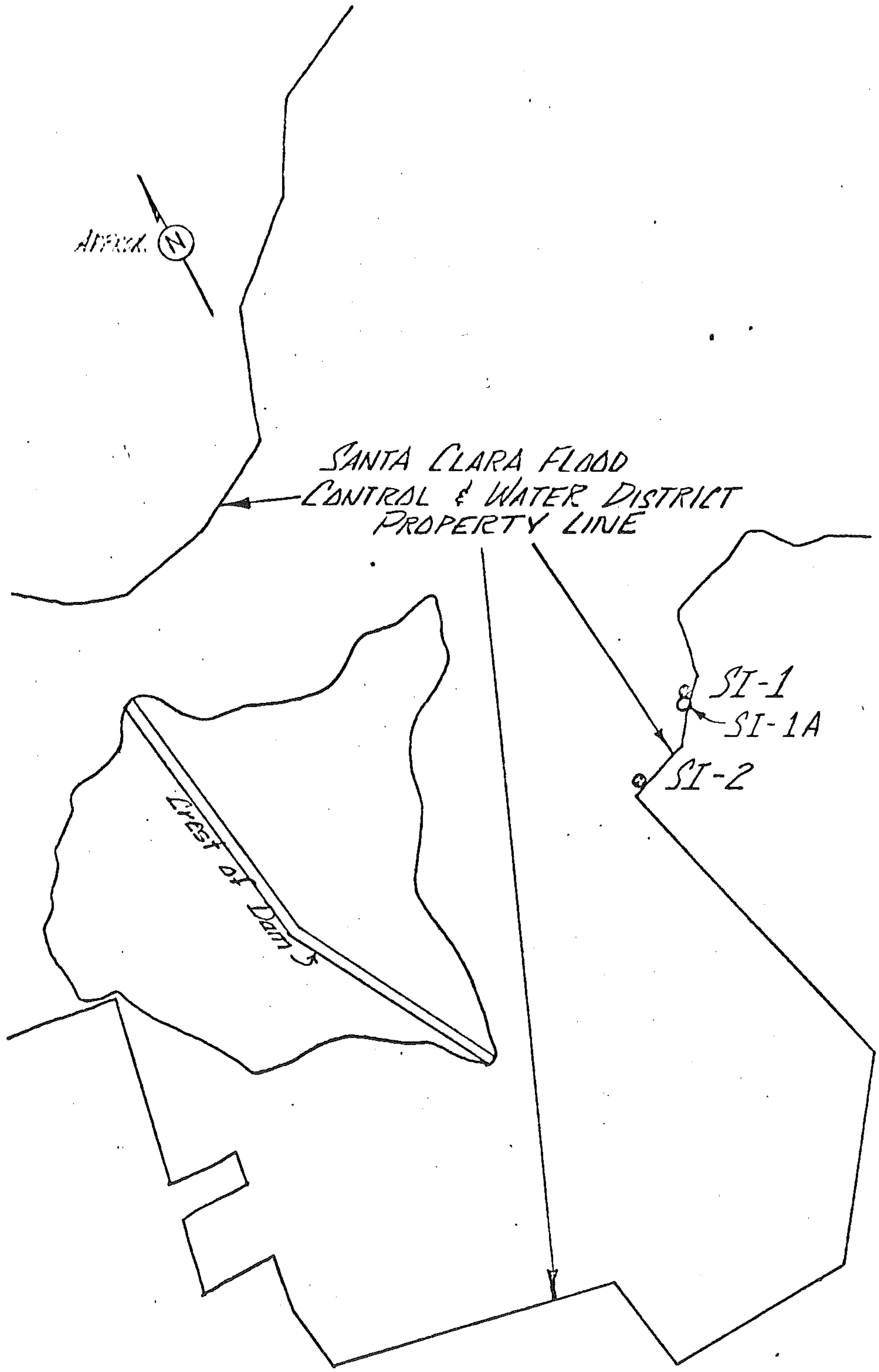
By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

Enclosures: Slope Indicator Data (SI-1A and SI-2)

S.C.C.F.C. & W.D.

'72 DEC 1 PM 1:44



REVISED 10-13-72 TO SHOW
SI-1A

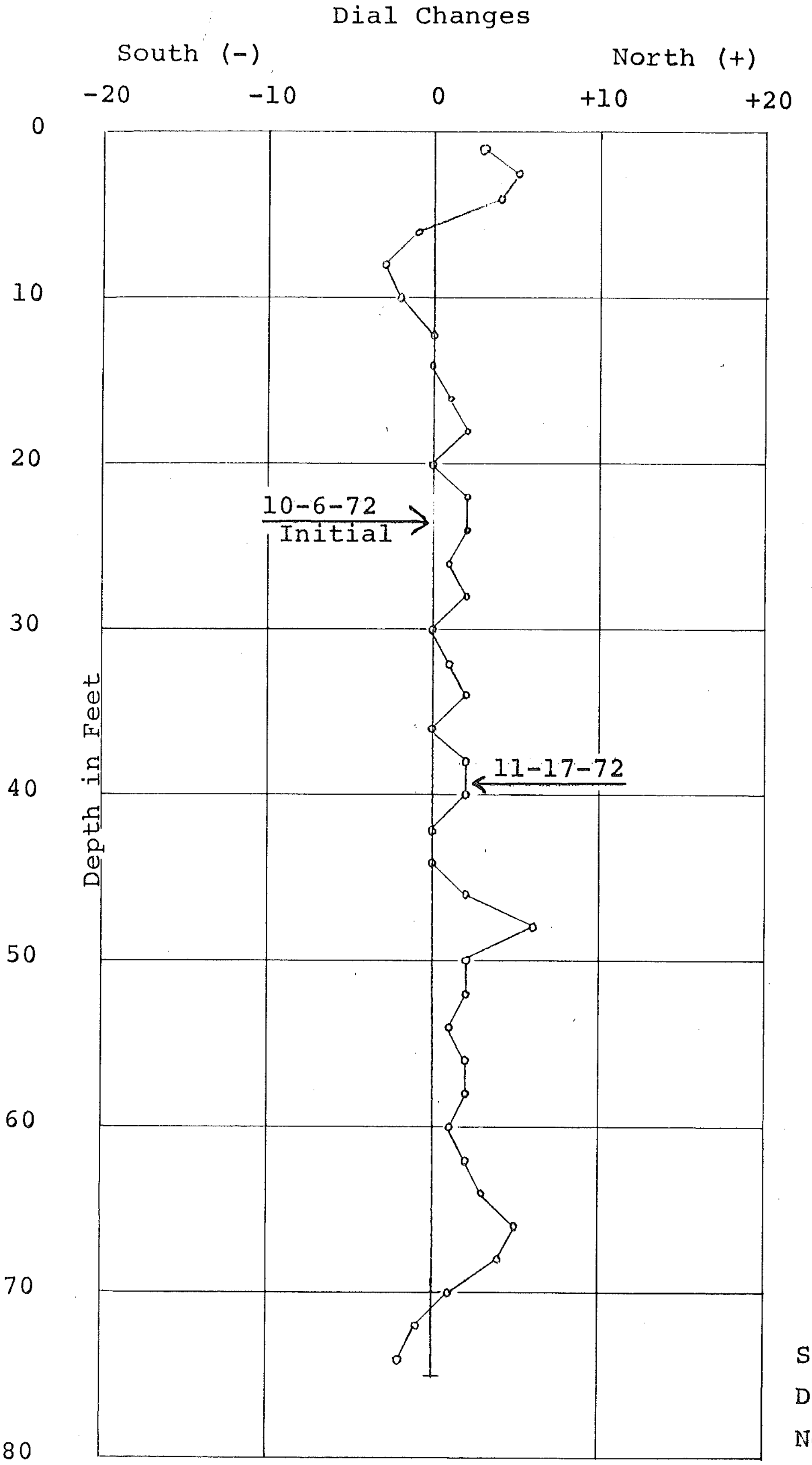
NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR
CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION

LOCATION SKETCH

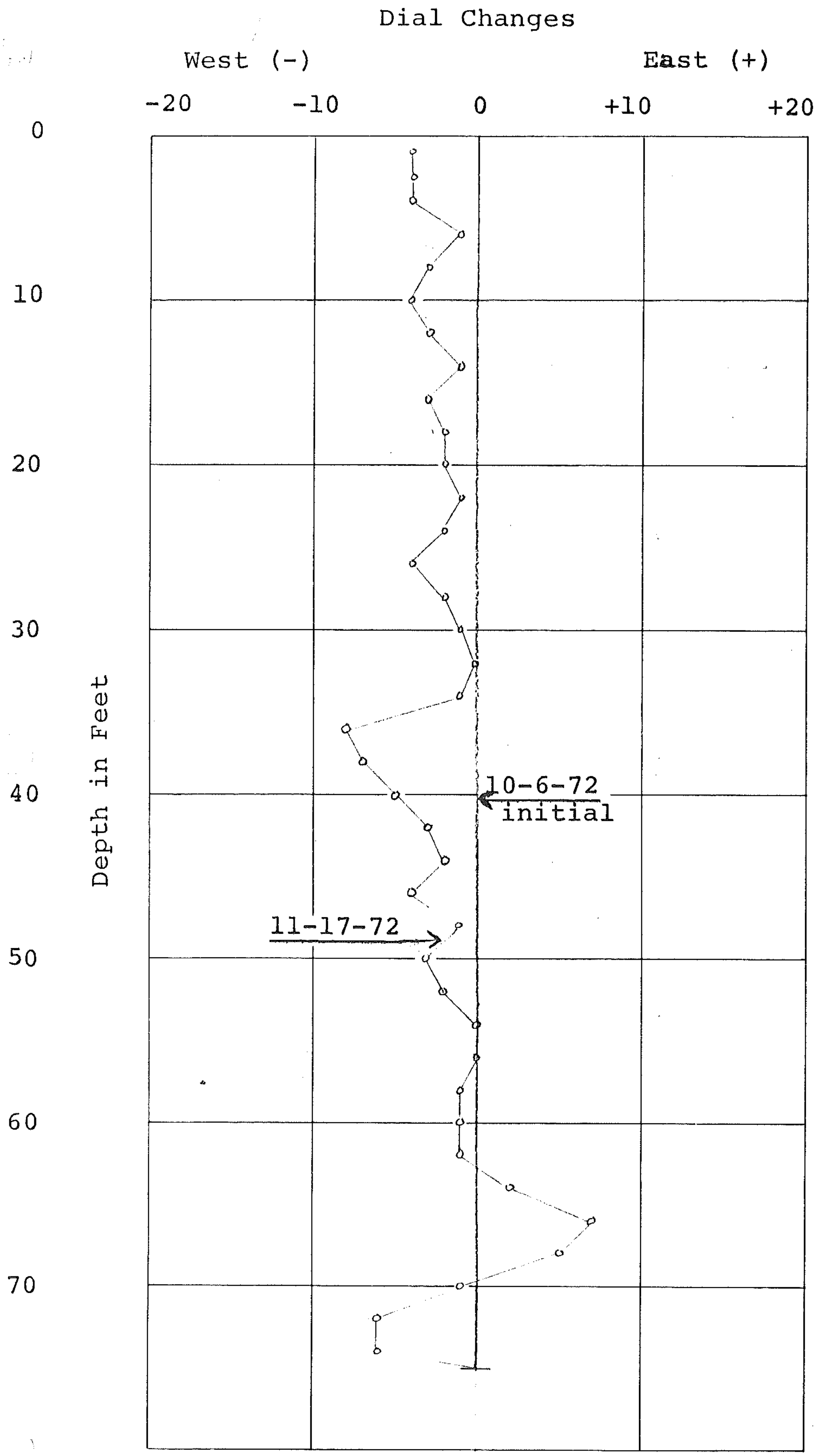
SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIG. 1



ANDERSON DAM
Slope Indicator SI-1A
Dial Changes vs Depth
North(+) - South(-)

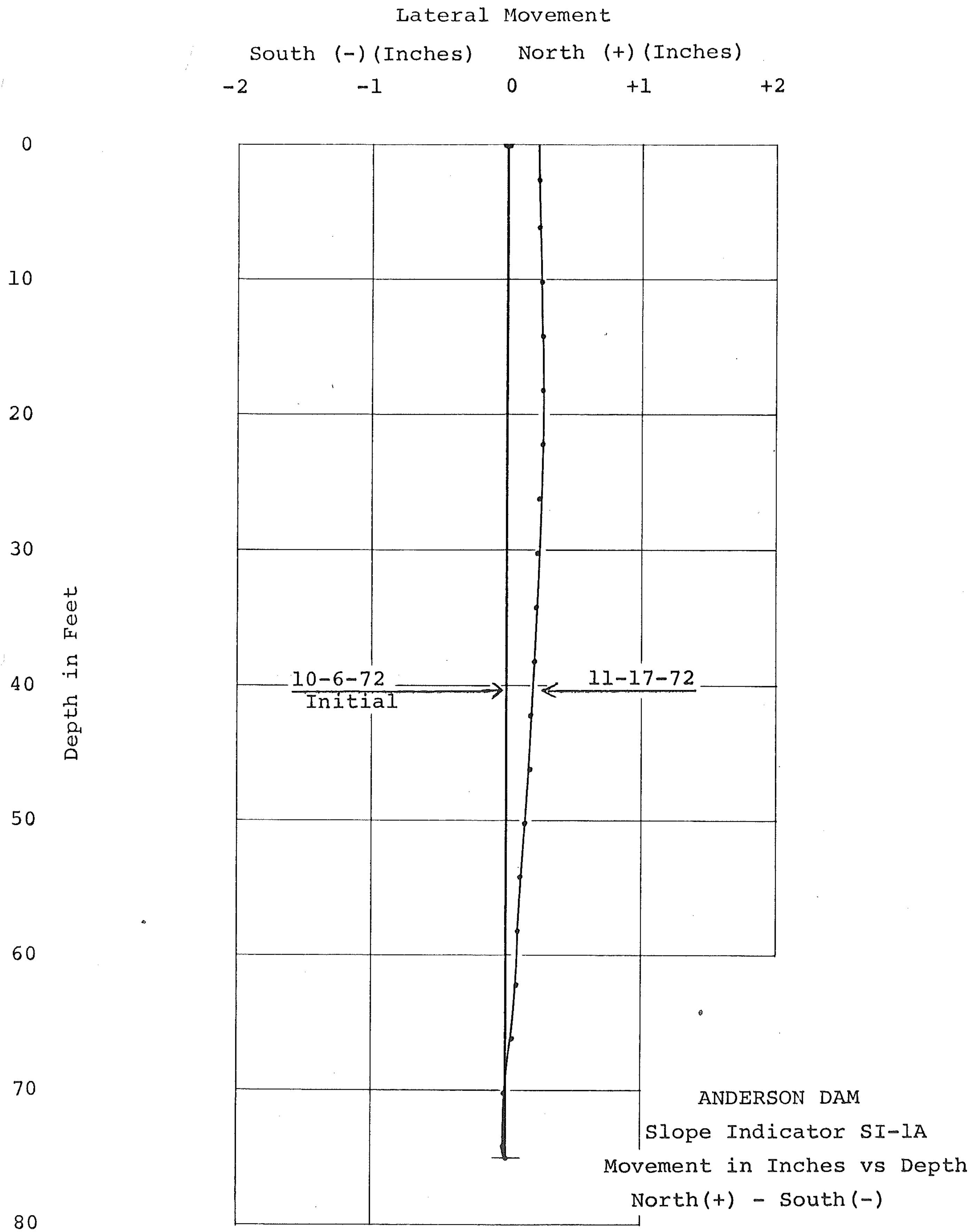
FIG. 2



ANDERSON DAM

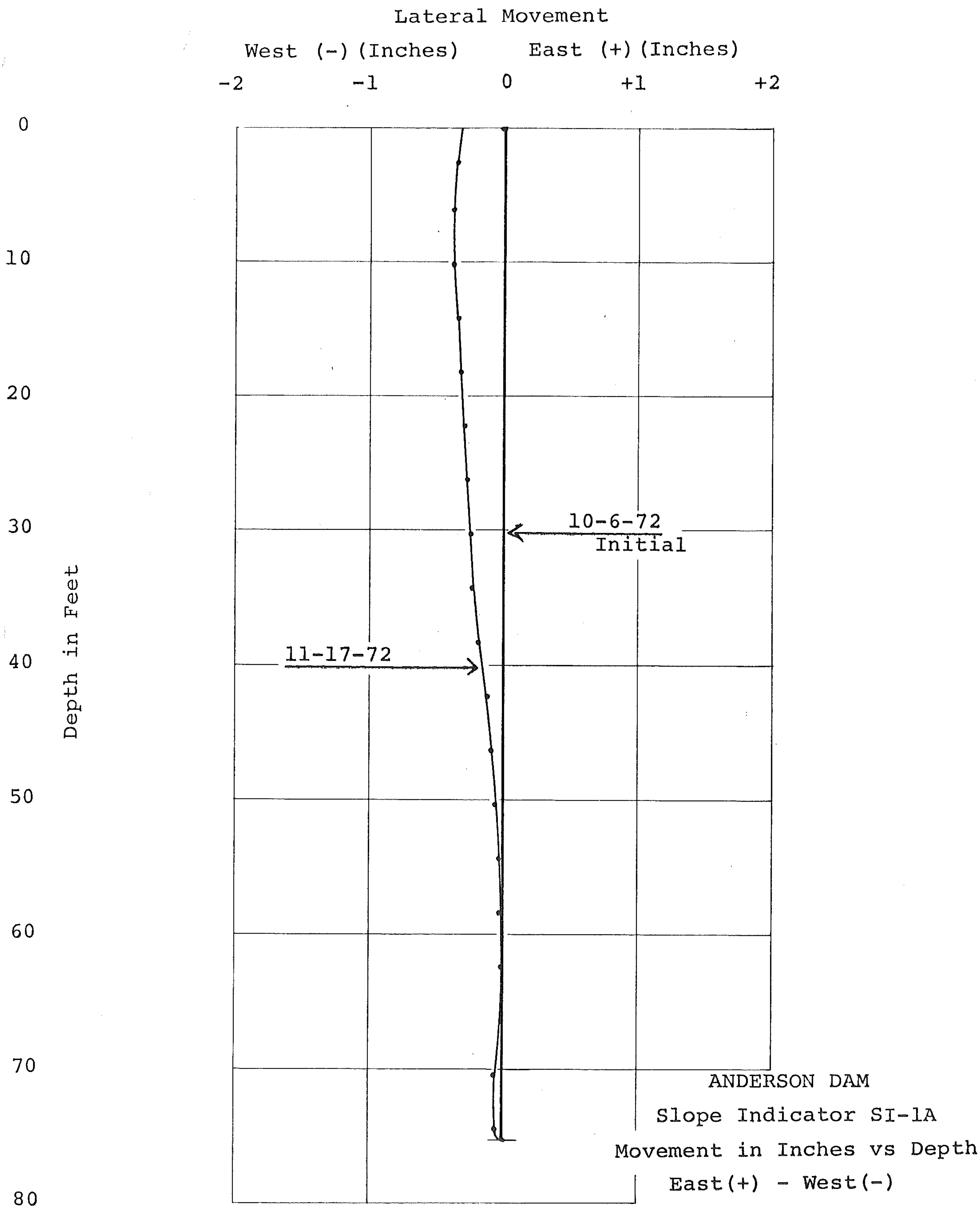
Slope Indicator SI-1A
Dial Changes vs Depth
East (+) - West (-)

FIG. 3



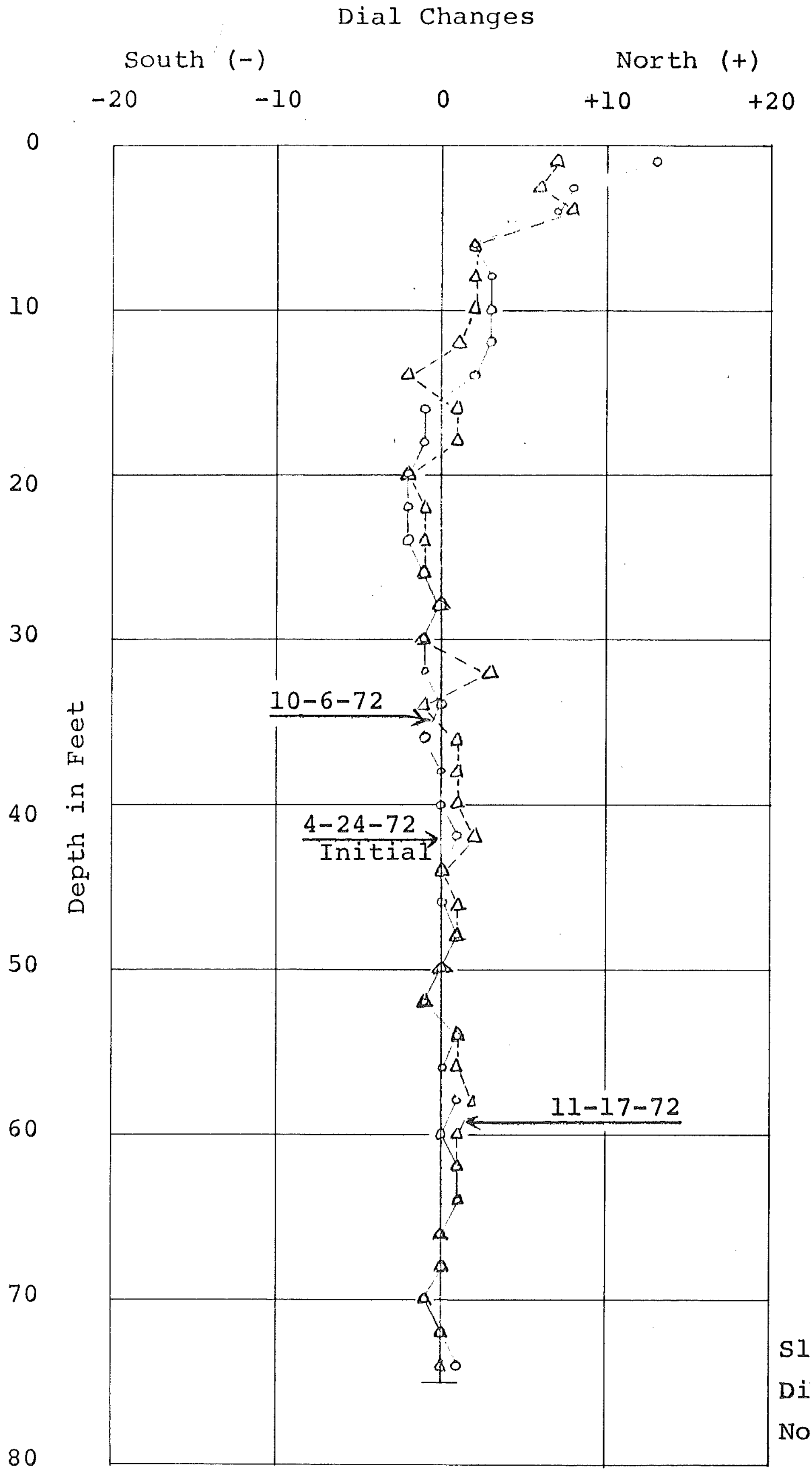
ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
North(+) - South(-)

FIG. 4



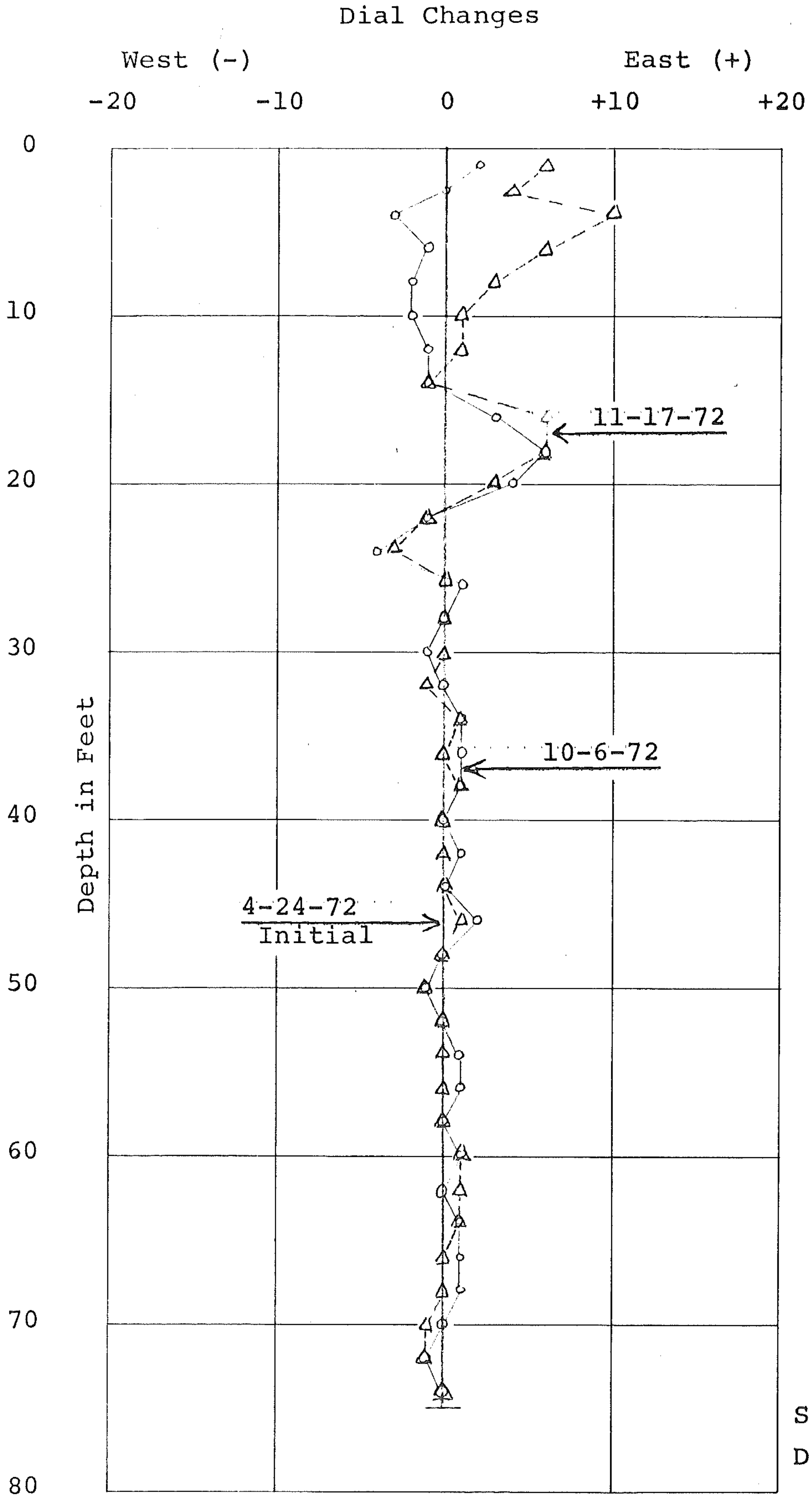
Lateral Movement
West (-) (Inches)
East (+) (Inches)
-2
-1
0
+1
+2
0
10
20
30
40
50
60
70
80
Depth in Feet
10-6-72
Initial
11-17-72
ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
East(+) - West(-)

FIG. 5



ANDERSON DAM
Slope Indicator SI-2
Dial Changes vs Depth
North(+) - South(-)

FIG. 6



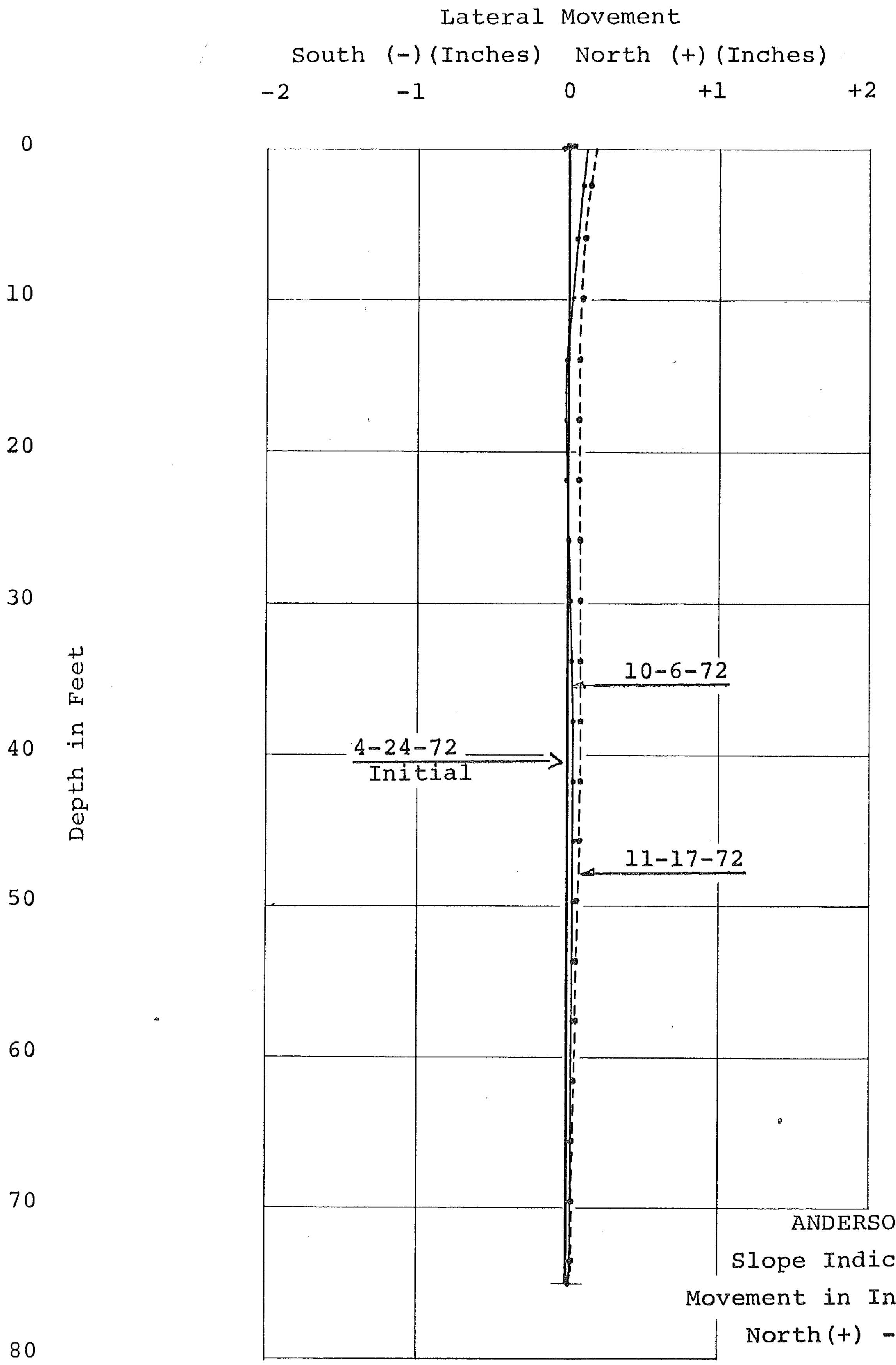
ANDERSON DAM

Slope Indicator SI-2

Dial Changes vs Depth

East(+) - West(-)

FIG. 7



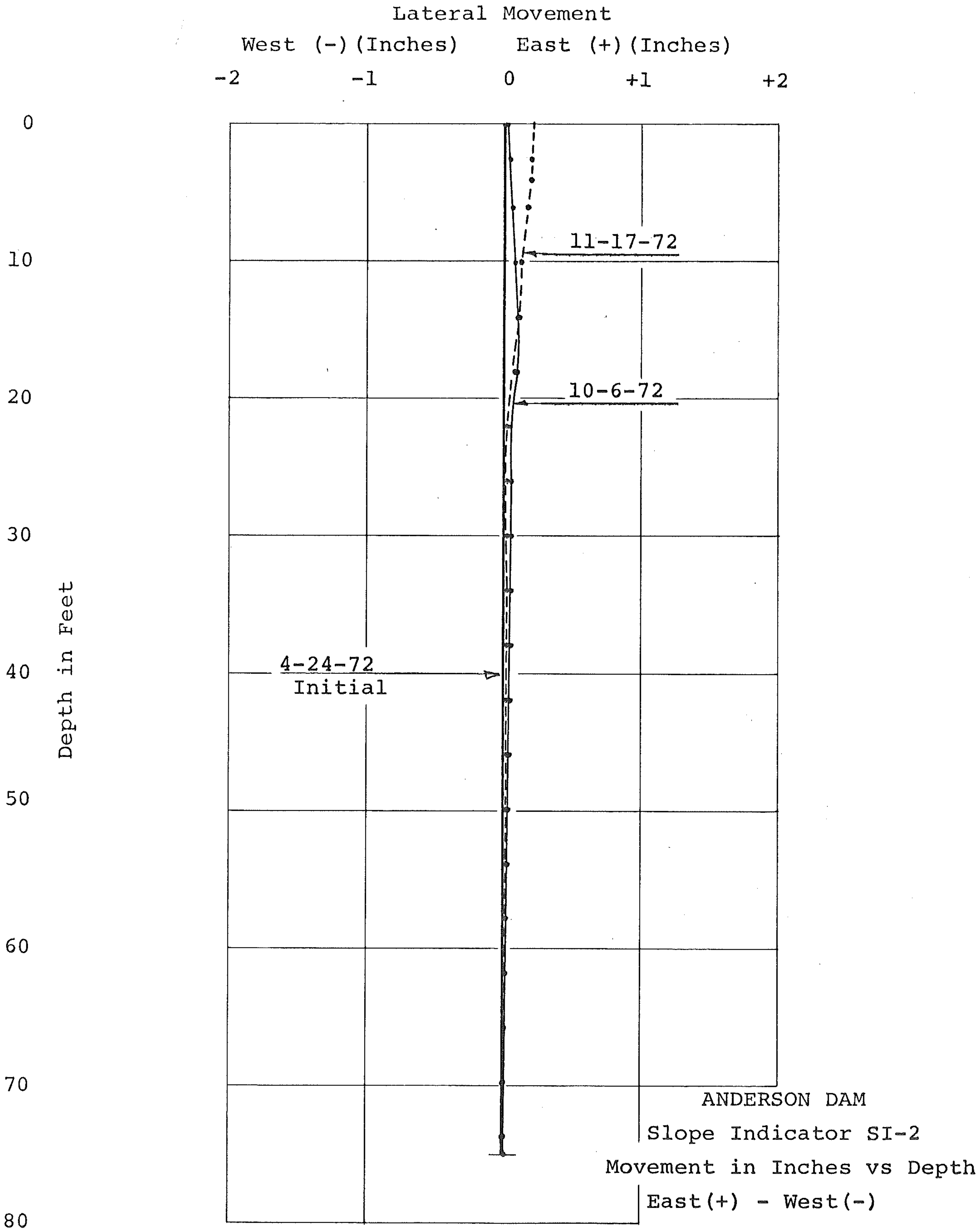
ANDERSON DAM

Slope Indicator SI-2

Movement in Inches vs Depth

North(+) - South(-)

FIG. 8



ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
East(+) - West(-)

FIG. 9

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-1A

ANDERSON DAM C-320
K=2000

SHEET 1 OF 1

DATE Nov. 17, 1972 INSTR 200B-13 READ RDP CALC RDP CHKD DH

DEPTH	DIFF.	AZ = N+	S-	DIFF.	CHANGE	DIFF.	AZ = E+	W-	DIFF.	CHANGE
1		516	599	-83 ✓			595	517	+ 78	✓
2.5		517	594	-77 ✓			596	515	+ 81	✓
4		517	594	-77 ✓			598	515	+ 83	✓
6		488	623	-135 ✓			640	472	+168	✓
8		486	624	-138 ✓			642	470	+172	✓
10	repeat	486	624	-138 ✓			643	470	+173	✓
12		485	626	-141 ✓			643	469	+174	✓
14		483	628	-145 ✓			644	468	+176	✓
16		460	650	-190 ✓			642	470	+172	✓
18		459	651	-192 ✓			641	471	+170	✓
20	repeat	456	654	-198 ✓			639	472	+167	✓
2		456	655	-199 ✓			638	474	+164	✓
4		455	656	-201 ✓			636	475	+161	✓
6		432	678	-246 ✓			611	502	+109	✓
8		431	681	-250 ✓			608	503	+105	✓
30	repeat	428	683	-255 ✓			607	505	+102	✓
2		426	685	-259 ✓			605	507	+ 98	✓
4		426	685	-259 ✓			602	512	+ 90	✓
6		396	714	-318 ✓			591	521	+ 70	✓
8		394	718	-324 ✓			590	523	+ 67	✓
40		391	721	-330 ✓			590	523	+ 67	✓
2		395	715	-320 ✓			592	523	+ 69	✓
4		401	712	-311 ✓			596	517	+ 79	✓
6		378	733	-355 ✓			562	550	+ 12	✓
8		376	738	-362 ✓			561	550	+ 11	✓
50		371	740	-369 ✓			564	550	+ 14	✓
2		370	741	-371 ✓			564	549	+ 15	✓
4		368	744	-376 ✓			561	552	+ 9	✓
6		357	751	-394 ✓			541	574	- 33	✓
8		357	754	-397 ✓			538	573	- 35	✓
60		355	755	-400 ✓			537	575	- 38	✓
2		356	756	-400 ✓			536	576	- 40	✓
4		355	756	-401 ✓			537	575	- 38	✓
6		365	746	-381 ✓			517	595	- 78	✓
8		363	747	-384 ✓			515	597	- 82	✓
70		361	750	-389 ✓			511	601	- 90	✓
2		359	751	-392 ✓			510	603	- 93	✓
4		358	753	-395 ✓			511	603	- 92	✓

THE SLOPE INDICATOR CO.

FIELD SHEET

SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-2

ANDERSON DAM C-320

K=2000

SHEET 1 OF 1

DATE Nov.17, 1972 INSTR. 200B-13 READ. RDP CALC. RDP CHKD. DH

DEPTH	DIFF.	AZ. = N+	S-	DIFF.	CHANGE	DIFF.	AZ. = E+	W-	DIFF.	CHANGE
1		570	534	+ 36 ✓			565	552	+ 13 ✓	
2.5		578	542	+ 36 ✓			561	547	+ 14 ✓	
4		576	535	+ 41 ✓			565	548	+ 17 ✓	
6		601	511	+ 90 ✓			581	533	+ 48 ✓	
8		601	511	+ 90 ✓			579	534	+ 45 ✓	
10	repeat	601	511	+ 90 ✓			578	535	+ 43 ✓	
12		599	512	+ 87 ✓			578	535	+ 43 ✓	
14		598	513	+ 85 ✓			576	536	+ 40 ✓	
16		580	532	+ 48 ✓			563	550	+ 13 ✓	
18		580	532	+ 48 ✓			561	552	+ 9 ✓	
20	repeat	579	534	+ 45 ✓			559	555	+ 4 ✓	
2		579	533	+ 46 ✓			555	558	- 3 ✓	
4		578	534	+ 44 ✓			554	559	- 5 ✓	
6		579	533	+ 46 ✓			557	556	+ 1 ✓	
8		581	534	+ 47 ✓			556	555	+ 1 ✓	
30	repeat	584	527	+ 57 ✓			558	557	+ 1 ✓	
2		584	527	+ 57 ✓			556	557	- 1 ✓	
4		583	530	+ 53 ✓			556	557	- 1 ✓	
6		588	522	+ 66 ✓			542	570	- 28 ✓	
8		588	523	+ 65 ✓			543	568	- 25 ✓	
40		588	523	+ 65 ✓			546	567	- 21 ✓	
2		588	524	+ 64 ✓			546	566	- 20 ✓	
4		587	524	+ 63 ✓			547	565	- 18 ✓	
6		588	523	+ 65 ✓			551	561	- 10 ✓	
8		588	523	+ 65 ✓			552	560	- 8 ✓	
50		590	523	+ 67 ✓			551	560	- 9 ✓	
2		587	525	+ 62 ✓			554	559	- 5 ✓	
4		588	526	+ 62 ✓			542	566	- 24 ✓	
6		589	522	+ 67 ✓			546	566	- 20 ✓	
8		589	522	+ 67 ✓			546	566	- 20 ✓	
60		588	523	+ 65 ✓			548	566	- 18 ✓	
2		587	525	+ 62 ✓			551	563	- 12 ✓	
4		588	524	+ 64 ✓			549	564	- 15 ✓	
6		576	536	+ 40 ✓			555	557	- 2 ✓	
8		576	536	+ 40 ✓			555	557	- 2 ✓	
70		578	533	+ 45 ✓			555	559	- 4 ✓	
2		579	533	+ 46 ✓			555	559	- 4 ✓	
4		578	534	+ 44 ✓			554	559	- 5 ✓	

THE SLOPE INDICATOR CO.
SEATTLE, WASHINGTON

SLOPE INDICATOR DATA

PROJECT ANDERSON DAM
Santa Clara County Flood Control and Water District

JOB NO. C-320 Sht. 1 of 2
OBSERVATION WELL NO. SI-1A
SLOT BEARING N$^{(+)}$ S$^{(-)}$

DEPTH	INITIAL	DATE 11-17-72 INST 200B-13 K= .005 0-5ft. .006 5-75ft				DATE INST K= C=				DATE INST K= C=				DATE INST K= C=				DATE INST K= C=				DATE INST K= C=			
	10-6-72	DIFF.	CHANGE	ΣCHANGE	DEFL. (INCHES)	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.
1	-86	-83	+3	+53																					
2.5	-82	-77	+5	+50	+,250																				
4	-81	-77	+4	+45																					
6	-134	-135	-1	+41	+,246																				
8	-135	-138	-3	+42																					
10	-136	-138	-2	+45	+,270																				
12	-141	-141	0	+47																					
14	-145	-145	0	+47	+,282																				
16	-191	-190	+1	+47																					
18	-194	-192	+2	+46	+,276																				
20	-198	-198	0	+44																					
2	-201	-199	+2	+44	+,264																				
4	-203	-201	+2	+42																					
6	-247	-246	+1	+40	+,240																				
8	-252	-250	+2	+39																					
30	-255	-255	0	+37	+,222																				
2	-260	-259	+1	+37																					
4	-261	-259	+2	+36	+,216																				
6	-318	-318	0	+34																					
8	-326	-324	+2	+34	+,204																				
40	-332	-330	+2	+32																					
2	-320	-320	0	+30	+,180																				
4	-311	311	0	+30																					
6	-357	-355	+2	+30	+,180																				
8	-368	-362	+6	+28																					
50	-371	-369	+2	+22	+,132																				
2	-373	-371	+2	+20																					
4	-377	-376	+1	+18	+,108																				
6	-396	-394	+2	+17																					
8	-399	-397	+2	+15	+,090																				
60	-401	-400	+1	+13																					
2	-402	-400	+2	+12	+,072																				
4	-404	-401	+3	+10																					
6	-386	-381	+5	+7	+,042																				
8	-388	-384	+4	+2																					
70	-390	-389	+1	-2	-,012																				
2	-391	-392	-1	-3																					
4	-393	-395	-2	-2	-,012																				
5	Bottom																								

THE SLOPE INDICATOR CO.
SEATTLE, WASHINGTON

SLOPE INDICATOR DATA

PROJECT ANDERSON DAM
Santa Clara County Flood Control and Water District

JOB NO. C-320 Sht. 2 of 2
OBSERVATION WELL NO. SI-1A
SLOT BEARING E(+) W(-)

DATE 11-17-72 INST. 200B-13
K= 2000 .005 0-5ft. .006 5-75ft.

DEPTH	INITIAL 10-6-72	DIFF.	CHANGE	ΣCHANGE	DEFL. (INCHES)
1	+82	+78	-4	-79	
2.5	+85	+81	-4	-75	-.375
4	+87	+83	-4	-71	
6	+169	+168	-1	-67	-.402
8	+175	+172	-3	-66	
10	+177	+173	-4	-63	-.378
12	+177	+174	-3	-59	
14	+177	+176	-1	-56	-.336
16	+175	+172	-3	-55	
18	+172	+170	-2	-52	-.312
20	+169	+167	-2	-50	
2	+165	+164	-1	-48	-.288
4	+163	+161	-2	-47	
6	+113	+109	-4	-45	-.270
8	+107	+105	-2	-41	
30	+103	+102	-1	-39	-.234
2	+98	+98	0	-38	
4	+91	+90	-1	-38	-.228
6	+78	+70	-8	-37	
8	+74	+67	-7	-29	-.174
40	+72	+67	-5	-22	
2	+72	+69	-3	-17	-.102
4	+81	+79	-2	-14	
6	+16	+12	-4	-12	-.072
8	+12	+11	-1	-8	
50	+17	+14	-3	-7	-.042
2	+17	+15	-2	-4	
4	+9	+9	0	-2	-.012
6	-33	-33	0	-2	
8	-34	-35	-1	-2	-.012
60	-37	-38	-1	-1	
2	-39	-40	-1	0	0
4	-40	-38	+2	+1	
6	-85	-78	+7	-1	-.006
8	-87	-82	+5	-8	
70	-89	-90	-1	-13	-.078
2	-87	-93	-6	-12	
4	-86	-92	-6	-6	-.036
5	Bottom				

DATE INST. K= C=

DIFF.	CHANGE	ΣCHANGE	DEFL.

DATE INST. K= C=

DIFF.	CHANGE	ΣCHANGE	DEFL.

DATE INST. K= C=

DIFF.	CHANGE	ΣCHANGE	DEFL.

DATE INST. K= C=

DIFF.	CHANGE	ΣCHANGE	DEFL.

DATE INST. K= C=

DIFF.	CHANGE	ΣCHANGE	DEFL.

THE SLOPE INDICATOR CO.
SEATTLE, WASHINGTON

SLOPE INDICATOR DATA

PROJECT ANDERSON RESERVOIR
Santa Clara County Flood Control and Water District

JOB NO. C-320 Sht. 1 of 2
OBSERVATION WELL NO. SI-2
SLOT BEARING $N^{(+)}$ - $S^{(-)}$

DEPTH	INITIAL	DATE 10-6-72 INST. 200B-13 K= 2000 C= .005 0-5' .006 5'-75'				DATE [illegible] INST. K= C=				DATE INST. K= C=				DATE INST. K= C=				DATE INST. K= C=				DATE INST. K= C=			
	4-24-72	DIFF.	CHANGE	ΣCHANGE	DEFL. (INCHES)	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.
1	+29	+42	+13	+34		+36	+7	+36																	
2.5	+30	+38	+8	+21	0.105	+36	+6	+29	+.145																
4	+33	+40	+7	+13		+41	+8	+23																	
6	+88	+90	+2	+6	0.036	+90	+2	+15	+.090																
8	+88	+91	+3	+4		+40	+2	+13																	
10	+88	+91	+3	+1	0.006	+90	+2	+11	+.066																
12	+86	+89	+3	-2		+87	+1	+9																	
14	+87	+89	+2	-5	-0.030	+85	-2	+8	+.048																
16	+47	+46	-1	-7		+48	+1	+10																	
18	+47	+46	-1	-6	-0.036	+48	+1	+9	+.054																
20	+47	+45	-2	-5		+45	-2	+8																	
2	+47	+45	-2	-3	-0.018	+46	-1	+10	+.060																
4	+45	+43	-2	-1		+44	-1	+11																	
6	+47	+46	-1	+1	0.006	+46	-1	+12	+.072																
8	+47	+47	0	+2		+47	0	+13																	
30	+58	+57	-1	+2	0.012	+57	-1	+13	+.078																
2	+54	+53	-1	+3		+57	+3	+14																	
4	+54	+54	0	+4	0.024	+53	-1	+11	+.066																
6	+65	+64	-1	+4		+66	+1	+12																	
8	+64	+64	0	+5	0.030	+65	+1	+11	+.066																
40	+64	+64	0	+5		+65	+1	+10																	
2	+62	+63	+1	+5	0.030	+64	+2	+9	+.054																
4	+63	+63	0	+4		+63	0	+7																	
6	+64	+64	0	+4	0.024	+65	+1	+7	+.042																
8	+64	+65	+1	+4		+65	+1	+6																	
50	+67	+67	0	+3	0.018	+67	0	+5	+.030																
2	+63	+62	-1	+3		+62	-1	+5																	
4	+61	+62	+1	+4	0.024	+62	+1	+6	+.036																
6	+66	+66	0	+3		+67	+1	+5																	
8	+65	+66	+1	+3	0.018	+67	+2	+4	+.024																
60	+64	+64	0	+2		+65	+1	+2																	
2	+61	+62	+1	+2	0.012	+62	+1	+1	+.006																
4	+63	+64	+1	+1		+64	+1	0																	
6	+40	+40	0	0	0	+40	0	-1	-.006																
8	+40	+40	0	0		+40	0	-1																	
70	+46	+45	-1	0	0	+45	-1	-1	-.006																
2	+46	+46	0	+1		+46	0	0																	
4	+44	+45	+1	+1	0.006	+44	0	0	0																
5	Bottom																								

THE SLOPE INDICATOR CO.
SEATTLE, WASHINGTON

SLOPE INDICATOR DATA

PROJECT ANDERSON RESERVOIR
Santa Clara County Flood Control and Water District

JOB NO. C-320 Sht. 2 of 2
OBSERVATION WELL NO. SI-2
SLOT BEARING $E^{(+)} - W^{(-)}$

DEPTH	INITIAL	DATE 10-6-72 INST. 200B-13				DATE 11-17-72 INST.				DATE INST.				DATE INST.				DATE INST.				DATE INST.			
		K= 2000 C= .005 0-5' .006 5'-75				K= C=				K= C=				K= C=				K= C=				K= C=			
	4-24-72	DIFF.	CHANGE	ΣCHANGE	DEFL. INCHES	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.
1	+7	+9	+2	+10		+13	+6	+43																	
2.5	+10	+10	0	+8	0.040	+14	+4	+37	+.185																
4	+7	+4	-3	+8		+17	+10	+33	+.165																
6	+42	+41	-1	+11	0.066	+48	+6	+23	+.138																
8	+42	+40	-2	+12		+45	+3	+17																	
10	+42	+40	-2	+14	0.084	+43	+1	+14	+.084																
12	+42	+41	-1	+16		+43	+1	+13																	
14	+41	+40	-1	+17	0.102	+40	-1	+12	+.072																
16	+7	+10	+3	+18		+13	+6	+13																	
18	+3	+9	+6	+15	0.090	+9	+6	+7	+.042																
20	+1	+5	+4	+9		+4	+3	+1																	
2	-2	-3	-1	+5	0.030	-3	-1	-2	-.012																
4	-2	-6	-4	+6		-5	-3	-1																	
6	+1	+2	+1	+10	0.060	+1	0	+2	+.012																
8	+1	+1	0	+9		+1	0	+2																	
30	+1	0	-1	+9	0.054	+1	0	+2	+.012																
2	0	0	0	+10		-1	-1	+2																	
4	-2	-1	+1	+10	0.060	-1	+1	+3	+.018																
6	-28	-27	+1	+9		-28	0	+2																	
8	-26	-25	+1	+8	0.048	-25	+1	+2	+.012																
40	-21	-21	0	+7		-21	0	+1																	
2	-20	-19	+1	+7	0.042	-20	0	+1	+.006																
4	-18	-18	0	+6		-18	0	+1																	
6	-11	-9	+2	+6	0.036	-10	+1	+1	+.006																
8	-8	-8	0	+4		-8	0	0																	
50	-8	-9	-1	+4	0.024	-9	-1	0	0																
2	-5	-5	0	+5		-5	0	+1																	
4	-24	-23	+1	+5	0.030	-24	0	+1	+.006																
6	-20	-19	+1	+4		-20	0	+1																	
8	-20	-20	0	+3	0.018	-20	0	+1	+.006																
60	-19	-18	+1	+3		-18	+1	+1																	
2	-13	-13	0	+2	0.012	-12	+1	0	0																
4	-16	-15	+1	+2		-15	+1	-1																	
6	-2	-1	+1	+1	0.006	-2	0	-2	-.012																
8	-2	-1	+1	0		-2	0	-2																	
70	-3	-3	0	-1	+0.006	-4	-1	-2	-.012																
2	-3	-4	-1	-1		-4	-1	-1																	
4	-5	-5	0	0	0	-5	0	0	0																
5	Bottom				0																				

S.C.C.F.C. & W.D.

'72 DEC 1 PM 1:45

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

October 16, 1972

Santa Clara County Flood Control
and Water District
5750 Alamaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine

Re: Slope Indicator
Installation
Anderson Reservoir

Gentlemen:

This letter presents the results of recent attempts to clean the debris out of Slope Indicator casing SI-1 and the drilling and installation of SI-1A located on the large slide area immediately northeast of the left abutment of Anderson Dam, Santa Clara County, California. Also included are the initial readings for SI-1A and the calculations for SI-2. This work was authorized by Mr. Jim Vantine on September 29, 1972, and was performed under Purchase Order No. 5046W.

SI-1 and SI-2 were installed and initial readings taken in April 1972. Subsequently, it was discovered by District personnel that vandals had broken the lock off of SI-1 and filled the Slope Indicator casing with an undetermined amount of debris. The Maintenance and Construction Division of the Santa Clara County Flood Control and Water District attempted to flush the debris from the casing with no success. The casing was blocked at a depth of 14 feet.

Field work was started on October 5, 1972, and completed on October 10, 1972. The flushing and drilling operations were accomplished under subcontract to the J.N. Pitcher Drilling Company of Daly City, California. Truck-mounted rotary drilling equipment was utilized, and all operations were observed by a geologist from Shannon & Wilson, Inc.

SI-1 was flushed clear to a depth of 26 feet by circulating bentonite drilling fluid through 3/4-inch pipe with the mud pump on the drill rig. The debris encountered in the casing consisted of tree limbs, sand, and large gravel. With the casing clear to 26 feet, a large gravel wedged between the casing and the flushing pipe and the casing pulled apart at the joint 25 feet below the surface. This halted any further attempts to try to recover the installation.

Seattle • Spokane • Portland • San Francisco (Burlingame)
William L. Shannon, P.E. • Stanley D. Wilson, P.E. • Earl A. Sibley, P.E. • Walter L. Wright, P.E. • Rudy J. Dietrich, P.E.

S.C.C.F.C. & W.D.
'72 OCT 18 PM 1:21

SI-1A is located six feet southwest of SI-1 and was drilled to a depth of 77 feet below existing ground surface. The materials encountered in the hole were sheared serpentine with scattered blocks of greenstone. A concentration of greenstone blocks from the surface to a depth of 30 feet was encountered and hard drilling was again experienced from a depth of 50 to 60 feet. Slope Indicator casing was installed in the hole to a depth of 75 feet.

As before, 3.19-inch O.D. aluminum Slope indicator casing was used. The hole was drilled to approximate installation depth utilizing fluid to stabilize the hole and return cuttings to the surface. The fluid was bailed out of the hole prior to installation of the casing. The annular space was backfilled with pea-gravel, densified by means of an air-driven vibrator suspended within the Slope Indicator casing.

The grooves in the casing controlling the orientation of the Slope Indicator instrument have been set so that the north-south grooves are parallel to the expected direction of movement with the north groove on the downslope side.

Upon completion of casing installation, initial readings were obtained with the Slope Indicator instrument. The initial set of readings is included for your information and records.

A set of readings was also obtained for SI-2. These readings were calculated and compared with the initial readings obtained in April 1972. It is concluded that no discernible movement has occurred at depth in this installation. Some deflection of the casing is present near the surface, and this is probably caused by recent truck traffic along the access road to SI-1A. The surface movements are quite small (in the order of 0.1") and are not large enough to develop a meaningful plot of deflection versus depth.

The present rate of movement (if any) of the slide area is still unknown, and we are entering the rainy season. It is imperative to obtain readings and define movements before excessive movements shear the casing. We, therefore, recommend Slope Indicator readings at relatively frequent intervals until movement trends are established. We recommend that a set of readings be obtained before the end of the year and another during the season of heavy rains. More frequent readings during periods of heavy rain may also be required.

We appreciate working with you on this project and look forward to the continuing study of the slide area. Please advise if you have any questions or require further information.

Very truly yours,

SHANNON & WILSON, INC.

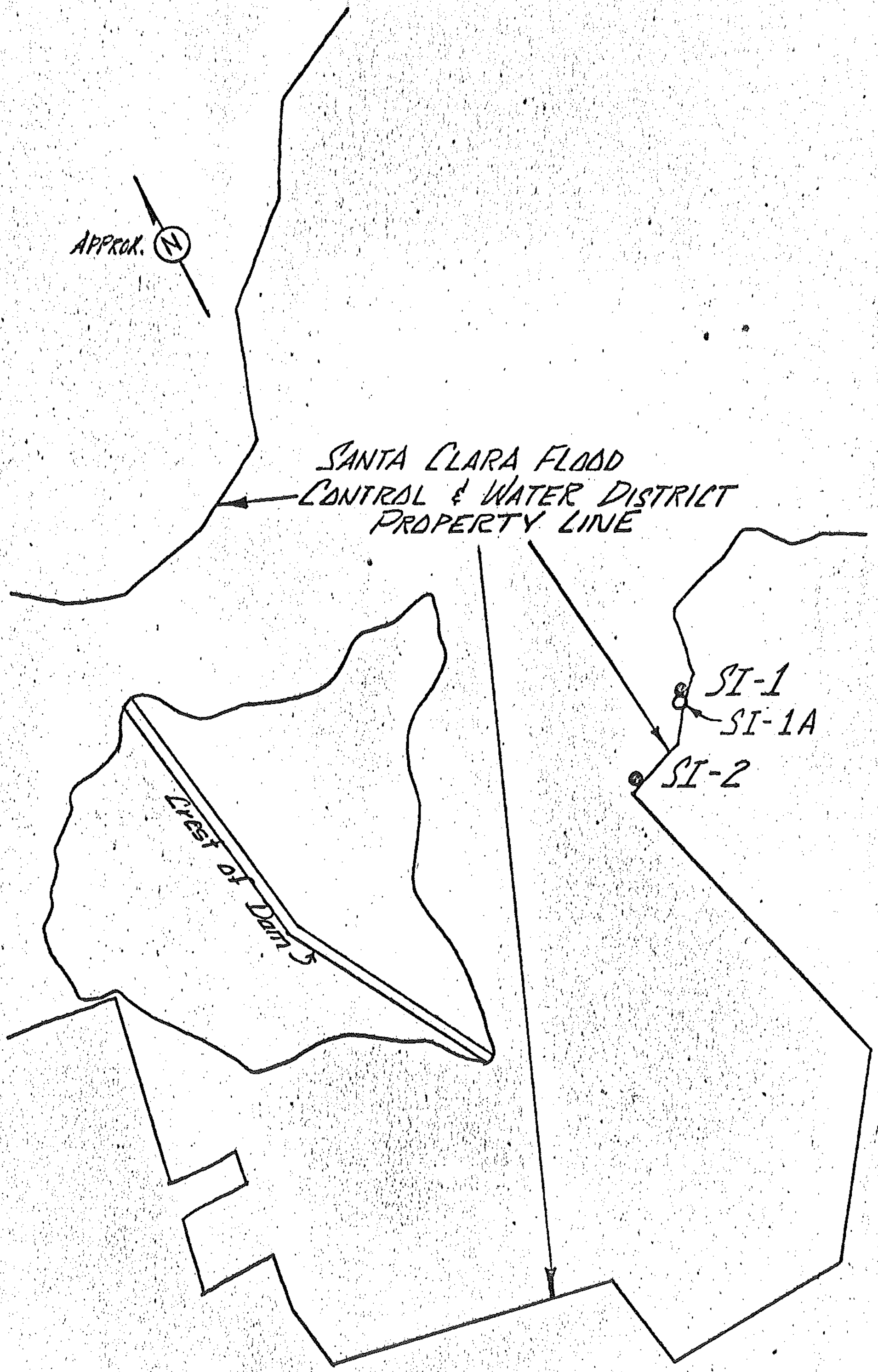
By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

Enclosures: Readings

S.C.C.F.C. & W.D.

'72 OCT 18 PM 1:21



REVISED 10-13-72 TO SHOW SI-1A

NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION

LOCATION SKETCH

SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIG. 1

THE SLOPE INDICATOR CO.

FIELD SHEET

SLOPE INDICATOR DATA
Anderson Dam C-320-01

OBSERVATION WELL NO. SI-1A

SHEET 1 OF 1

Initial Readings K=2000

DATE Oct.10,1972 INSTR. 200B-13 READ. RDP CALC. RDP CHKD. meh

DEPTH	DIFF.	AZ. =		DIFF.	CHANGE	DIFF.	AZ. =		DIFF.	CHANGE
		N+	S-				E+	W-		
1		515	601	- 86			599	517	+ 82	
2.5		517	599	- 82			600	515	+ 85	
4		518	599	- 81			602	515	+ 87	
6		490	624	-134			642	473	+169	
8		490	625	-135			645	470	+175	
10		489	625	-136			646	469	+177	
12		487	628	-141			646	469	+177	
14		485	630	-145			646	469	+177	
16		462	653	-191			645	470	+175	
18		460	654	-194			644	472	+172	
20		458	656	-198			642	473	+169	
2		456	657	-201			640	475	+165	
4		456	659	-203			640	477	+163	
6		433	680	-247			615	502	+113	
8		432	684	-252			611	504	+107	
30		429	684	-255			609	506	+103	
2		427	687	-260			607	509	+ 98	
4		427	688	-261			604	513	+ 91	
6		398	716	-318			598	520	+ 78	
8		395	721	-326			594	520	+ 74	
40		392	724	-332			594	522	+ 72	
2		396	716	-320			595	523	+ 72	
4		402	713	-311			599	518	+ 81	
6		379	736	-357			566	550	+ 16	
8		375	743	-368			564	552	+ 12	
50		372	743	-371			567	550	+ 17	
2		371	744	-373			567	550	+ 17	
4		370	747	-377			563	554	+ 9	
6		358	754	-396			543	576	- 33	
8		358	757	-399			541	575	- 34	
60		356	757	-401			540	577	- 37	
2		357	759	-402			538	577	- 39	
4		355	759	-404			538	578	- 40	
6		364	750	-386			516	601	- 85	
8		364	752	-388			515	602	- 87	
70		362	752	-390			513	602	- 89	
2		362	753	-391			515	602	- 87	
4		361	754	-393			515	601	- 86	

NOTE: All depths referenced to top Slope Indicator Casing.

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-2

Anderson Dam C-320-01
K=2000

SHEET 1 OF 1

DATE October 6,1972 INSTR 200B-13 READ. RDP CALC. RDP CHKD. meh

DEPTH	DIFF.	AZ. =		DIFF.	CHANGE	DIFF.	AZ. =		DIFF.	CHANGE
		N(+)	S(-)				E(+)	W(-)		
1		576	534	+42			565	556	+ 9	
2.5		581	543	+38			563	553	+10	
4		578	538	+40			561	557	+ 4	
6		603	513	+90			579	538	+41	
8		604	513	+91			578	538	+40	
10		604	513	+91			578	538	+40	
12		603	514	+89			579	538	+41	
14		603	514	+89			578	538	+40	
16		582	536	+46			563	553	+10	
18		582	536	+46			563	554	+ 9	
20		581	536	+45			561	556	+ 5	
22		581	536	+45			557	560	- 3	
24		580	537	+43			555	561	- 6	
26		582	536	+46			559	557	+ 2	
28		583	536	+47			558	557	+ 1	
30		586	529	+57			559	559	0	
32		585	532	+53			558	558	0	
34		586	532	+54			558	559	- 1	
36		590	526	+64			545	572	-27	
38		590	526	+64			545	570	-25	
40		590	526	+64			547	568	-21	
42		590	527	+63			549	568	-19	
44		590	527	+63			549	567	-18	
46		590	526	+64			554	563	- 9	
48		591	526	+65			554	562	- 8	
50		592	525	+67			553	562	- 9	
2		589	527	+62			556	561	- 5	
4		590	528	+62			544	567	-23	
6		591	525	+66			548	567	-19	
8		591	525	+66			548	568	-20	
60		589	525	+64			550	568	-18	
2		589	527	+62			552	565	-13	
4		590	526	+64			551	566	-15	
6		578	538	+40			558	559	- 1	
8		578	538	+40			558	559	- 1	
70		580	535	+45			558	561	- 3	
2		581	535	+46			557	561	- 4	
4		581	536	+45			556	561	- 5	

THE SLOPE INDICATOR CO.
SEATTLE, WASHINGTON

SLOPE INDICATOR DATA

PROJECT ANDERSON RESERVOIR
Santa Clara County Flood Control and Water District

JOB NO. C-320 Sht. 1
OBSERVATION WELL NO. SI-2
SLOT BEARING $N^{(+)}$ - $S^{(-)}$

DEPTH	INITIAL 4-24-72	DATE 10-6-72 INST. 200B-13 K= 2000 C= .005 0-5' .006 5'-75' DIFF.	CHANGE	ΣCHANGE	DEFL. (INCHES)
1	+29	+42	+13	+34	
2.5	+30	+38	+8	+21	0.165
4	+33	+40	+7	+13	
6	+88	+90	+2	+6	0.036
8	+88	+91	+3	+4	
10	+88	+91	+3	+1	0.006
12	+86	+89	+3	-2	
14	+87	+89	+2	-5	-0.030
16	+47	+46	-1	-7	
18	+47	+46	-1	-6	-0.036
20	+47	+45	-2	-5	
2	+47	+45	-2	-3	-0.018
4	+45	+43	-2	-1	
6	+47	+46	-1	+1	0.006
8	+47	+47	0	+2	
30	+58	+57	-1	+2	0.012
2	+54	+53	-1	+3	
4	+54	+54	0	+4	0.024
6	+65	+64	-1	+4	
8	+64	+64	0	+5	0.030
40	+64	+64	0	+5	
2	+62	+63	+1	+5	0.030
4	+63	+63	0	+4	
6	+64	+64	0	+4	0.024
8	+64	+65	+1	+4	
50	+67	+67	0	+3	0.018
2	+63	+62	-1	+3	
4	+61	+62	+1	+4	0.024
6	+66	+66	0	+3	
8	+65	+66	+1	+3	0.018
60	+64	+64	0	+2	
2	+61	+62	+1	+2	0.012
4	+63	+64	+1	+1	
6	+40	+40	0	0	0
8	+40	+40	0	0	
70	+46	+45	-1	0	0
2	+46	+46	0	+1	
4	+44	+45	+1	+1	0.006
5	Bottom				

DATE INST. K= C= DIFF.	CHANGE	ΣCHANGE	DEFL.	DATE INST. K= C= DIFF.	CHANGE	ΣCHANGE	DEFL.	DATE INST. K= C= DIFF.	CHANGE	ΣCHANGE	DEFL.	DATE INST. K= C= DIFF.	CHANGE	ΣCHANGE	DEFL.	DATE K= DIFF.	CHANGE

of 2

T.

ANGE	DEFL.

THE SLOPE INDICATOR CO.
SEATTLE, WASHINGTON

SLOPE INDICATOR DATA

PROJECT ANDERSON RESERVOIR
Santa Clara County Flood Control and Water District

JOB NO. C-320 Sht. 2 of 2
OBSERVATION WELL NO. SI-2
SLOT BEARING E(+) - W(-)

DEPTH	INITIAL	DATE 10-6-72 INST 200B-13 K= 2000 C= .005 0-5' .006 5'-75'				DATE INST K= C=				DATE INST K= C=				DATE INST K= C=				DATE INST K= C=				DATE INST K= C=			
	4-24-72	DIFF.	CHANGE	ΣCHANGE	DEFL. (INCHES)	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.	DIFF.	CHANGE	ΣCHANGE	DEFL.
1	+7	+9	+2	+10																					
2.5	+10	+10	0	+8	0.040																				
4	+7	+4	-3	+8																					
6	+42	+41	-1	+11	0.066																				
8	+42	+40	-2	+12																					
10	+42	+40	-2	+14	0.084																				
12	+42	+41	-1	+16																					
14	+41	+40	-1	+17	0.102																				
16	+7	+10	+3	+18																					
18	+3	+9	+6	+15	0.090																				
20	+1	+5	+4	+9																					
2	-2	-3	-1	+5	0.030																				
4	-2	-6	-4	+6																					
6	+1	+2	+1	+10	0.060																				
8	+1	+1	0	+9																					
30	+1	0	-1	+9	0.054																				
2	0	0	0	+10																					
4	-2	-1	+1	+10	0.060																				
6	-28	-27	+1	+9																					
8	-26	-25	+1	+8	0.048																				
40	-21	-21	0	+7																					
2	-20	-19	+1	+7	0.042																				
4	-18	-18	0	+6																					
6	-11	-9	+2	+6	0.036																				
8	-8	-8	0	+4																					
50	-8	-9	-1	+4	0.024																				
2	-5	-5	0	+5																					
4	-24	-23	+1	+5	0.030																				
6	-20	-19	+1	+4																					
8	-20	-20	0	+3	0.018																				
60	-19	-18	+1	+3																					
2	-13	-13	0	+2	0.012																				
4	-16	-15	+1	+2																					
6	-2	-1	+1	+1	0.006																				
8	-2	-1	+1	0																					
70	-3	-3	0	-1	-0.006																				
2	-3	-4	-1	-1																					
4	-5	-5	0	0	0																				
5	Bottom				0																				

S.C.C.F.C. & W.D.
'72 OCT 18 PM 1:21

	Init	'73	Code
CURRLIN			
ENANDER			
ESAU			
FOWLER			
GARRETT			
HENLEY			
WILSON			

	Init	'73	Code			Init	'73	Code			Init	'73	Code
CURRLIN					GARRETT					ENANDER			
Esau					Bundy					Lowrance			
Holley					Bramblett					Newland			
Public Info					Donnell					Library			
WILSON					Bauer					FOWLER			
FRANCIS					Grafe					Allen			
Bregger					Smith					Roman			
Gray					Yandell								
BEAUDET					KORBAY				1	WATKINS	JW		
Clarke					Burns					Burke			
Erling					Ferris					Church			
Kriege					Ferguson					Gill			
Lundahl					Hall				2	Watson			
Regadanz					Lawrie								
					Richardson								

ACTION CODES
A. RUSH
B. CONTACT ME
C. FOLLOW-UP
D. COMMENT
E. ACTION
F. INFORMATION
G. RETURN
H. FILE
I. APPROVAL
J. DUE DATE:

REMARKS: Copy to EW w/A, RA

Gene what are we going to do with this?

Answered verbally
EW

ORIGINAL LETTER IS IN CENTRAL FILES. PLEASE RETURN THIS COPY TO CENTRAL FILES ONLY IF THERE ARE ENCLOSURES OR ATTACHMENTS.

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

S.C.C.F.C. & W.D.
'73 FEB 5 PM 4:08

February 2, 1973

Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine

Re: Slope Indicators
Anderson Dam

Gentlemen:

This letter presents the results of a recent survey of Slope Indicator casings, SI-1A and SI-2, located on the large slide area immediately northeast of the left abutment of Anderson Dam, Santa Clara County, California. This work was authorized by Mr. James Vantine and was performed under Purchase Order No. 3755.

The readings were obtained on January 25, 1973. A series 200B Slope Indicator instrument was used, and readings were obtained at two-foot increments of depth; plots of dial differences versus depth and actual deflection in inches versus depth are included for each set of grooves in the two installations. All plots are referenced to the initial readings for each casing. Field data sheets showing actual dial readings and summary sheets listing the casing deflection in inches for every four feet of depth are on file in our office.

SI-1A shows movement in the order of 0.7 inches in the north (downslope) direction at the 46 to 50-foot depth interval (Fig. 4). This type of movement is characteristic of a shear zone. The casing also has a minor component of movement in a westerly direction (Fig. 5). Movement at the surface is in the order of one inch with the top of the casing deflected in a north-northwesterly direction. SI-2 shows no discernible movement at depth (Fig. 8 and 9). Some deflection of the casing can be observed near the surface in an easterly direction. The apparent movement at the surface is in the order of 0.4 inches.

The movement observed at the 46 to 50-foot depth interval in SI-1A is probably indicative of a shear plane. Future Slope Indicator readings in this zone should be taken every six inches to further define the movement. No trend of movement can be established for SI-2 at this time.

William L. Shannon, P.E. • Stanley D. Wilson, P.E. • Earl A. Sibley, P.E. • Walter L. Wright, P.E. • Rudy J. Dietrich, P.E. • Sigmund D. Schwarz, C.E.G.

Seattle • Spokane • Portland • San Francisco (Burlingame)

We recommend that the District continue the combination of surface survey measurements and downhole readings of the Slope Indicator casings. Surface survey measurements should be obtained early in February and again early in March. It is requested that these data be made available for our review. Slope Indicator readings should be taken early in March and compared with the surface survey measurements. If the surface measurements indicate that significant movements are occurring, Slope Indicator readings should be obtained prior to the recommended reading in March.

Please advise if you have any questions or require further information.

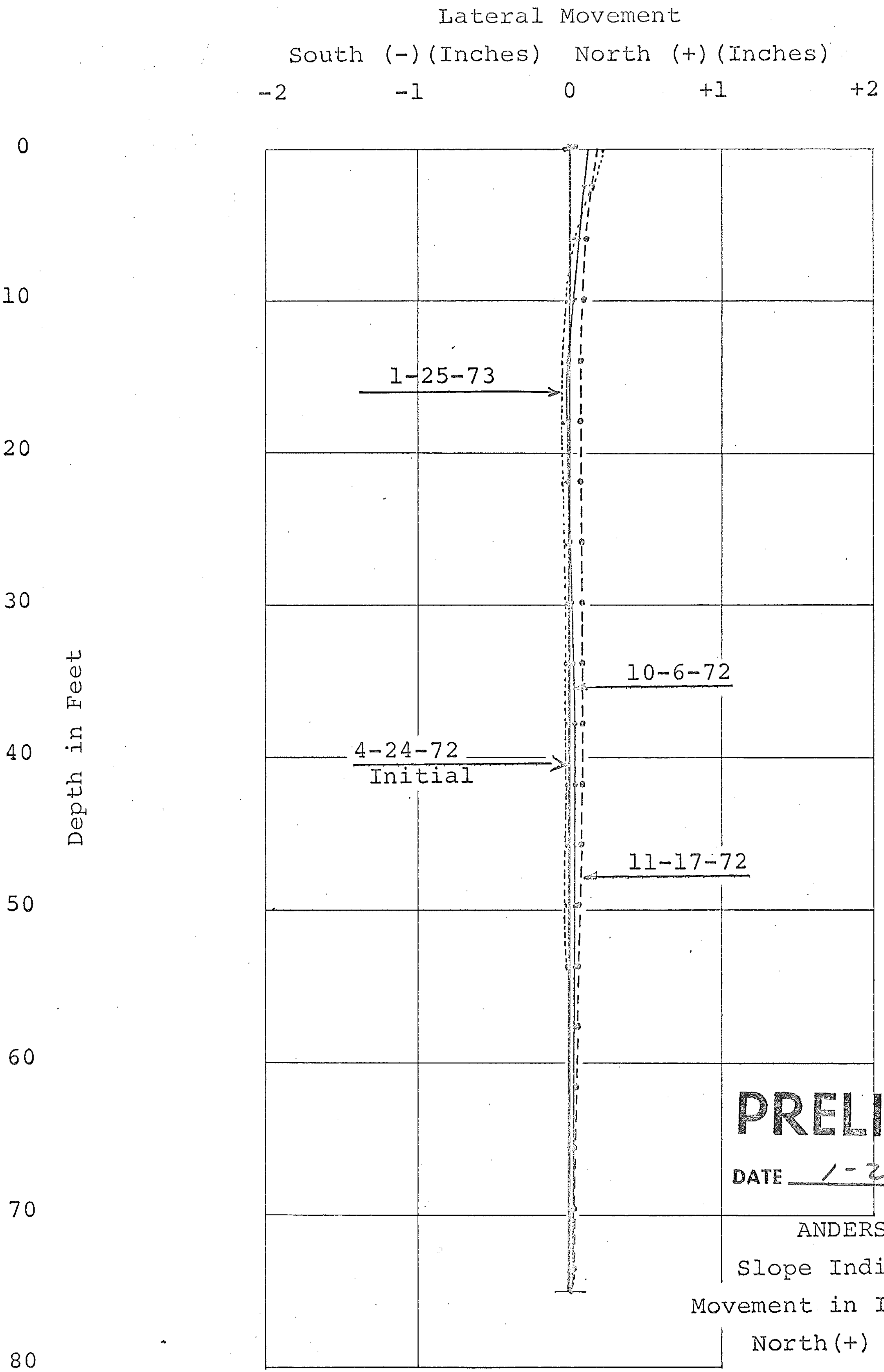
Very truly yours,

SHANNON & WILSON, INC.

By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

Enclosures: Slope Indicator Plots



PRELIMINARY

DATE 1-26-73

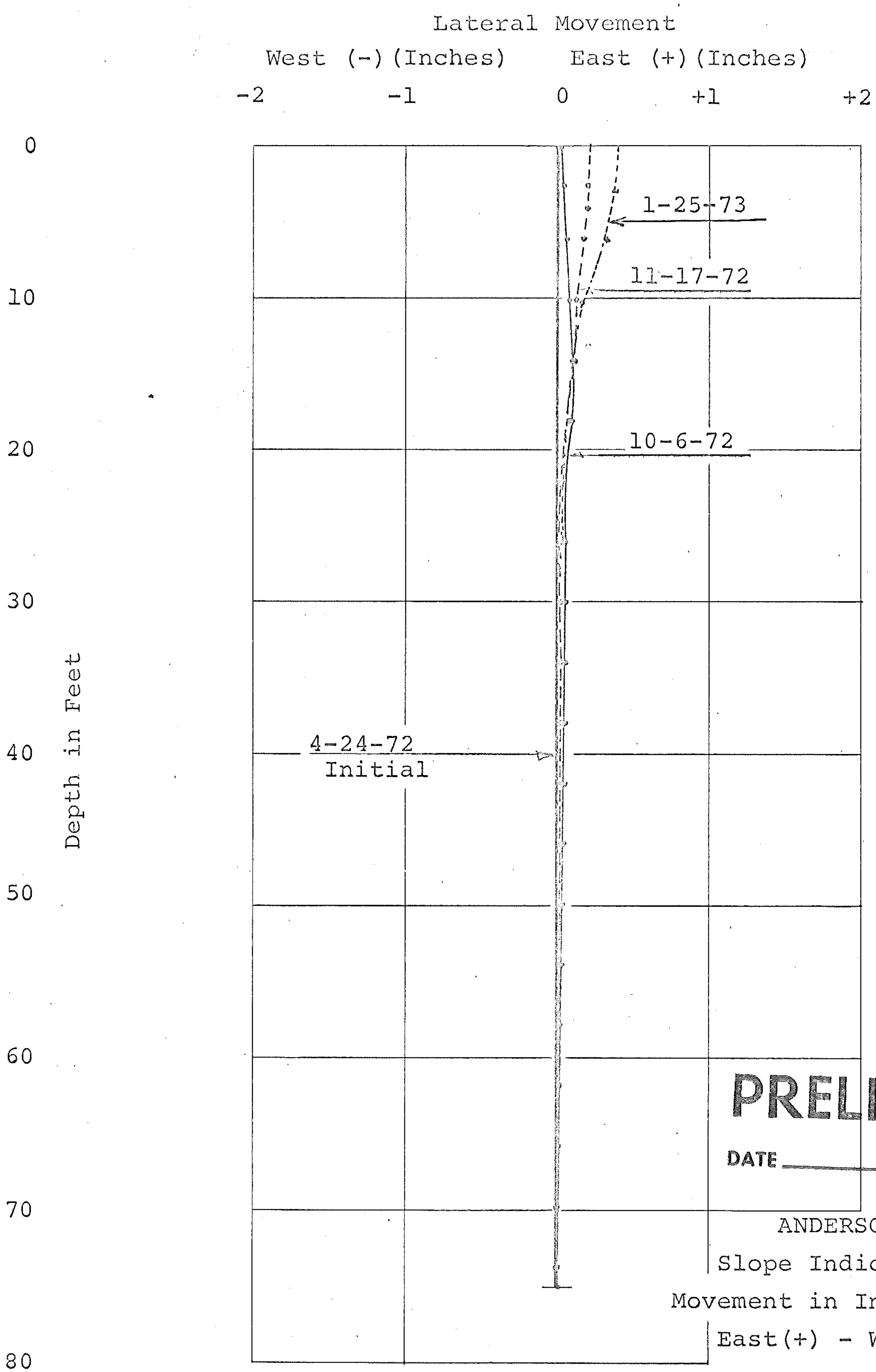
ANDERSON DAM

Slope Indicator SI-2

Movement in Inches vs Depth

North(+) - South(-)

FIG. 8

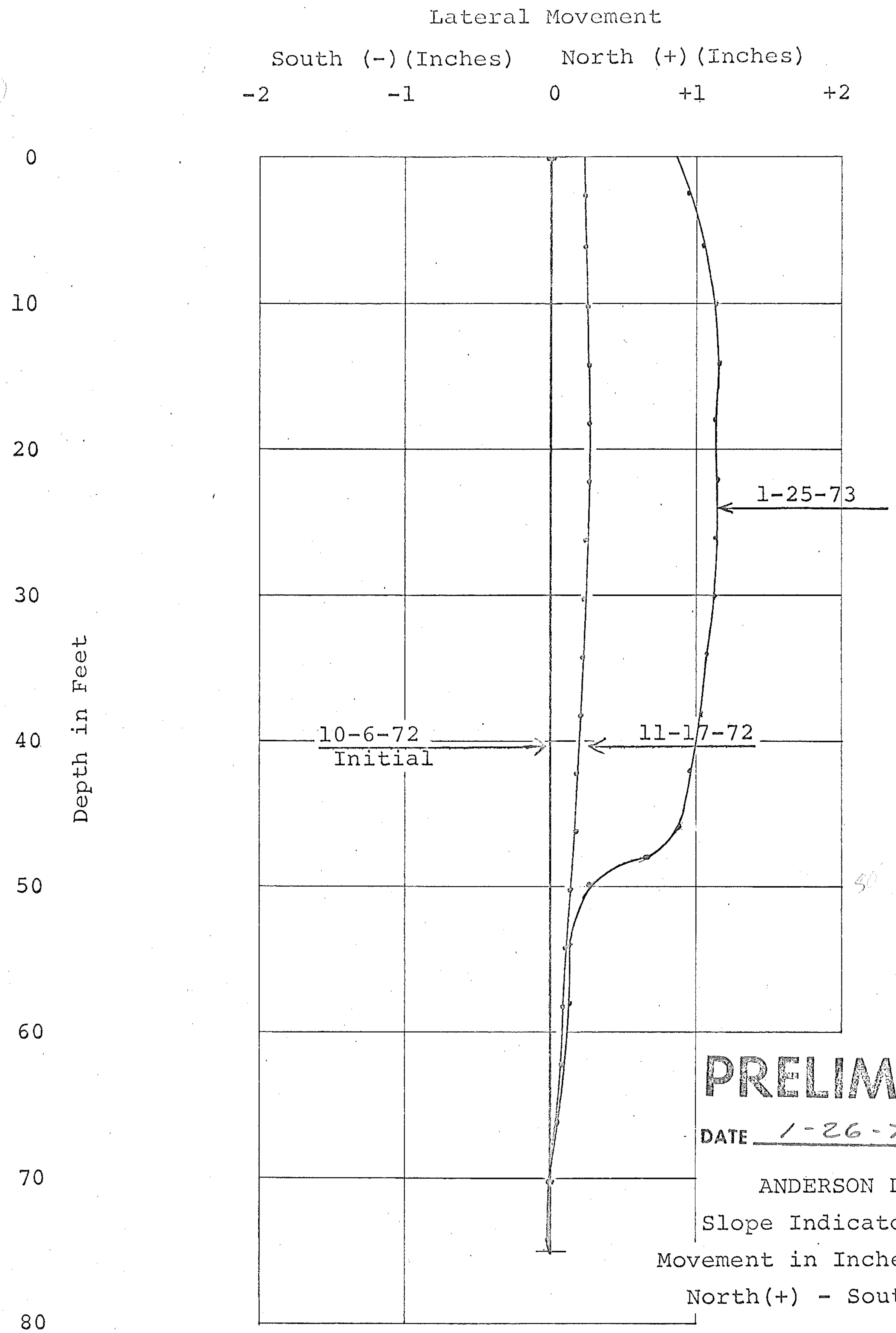


PRELIMINARY

DATE 1-26-73

ANDERSON DAM
Slope Indicator SI-2
Movement in Inches vs Depth
East(+) - West(-)

FIG. 9



PRELIMINARY

DATE 1-26-73

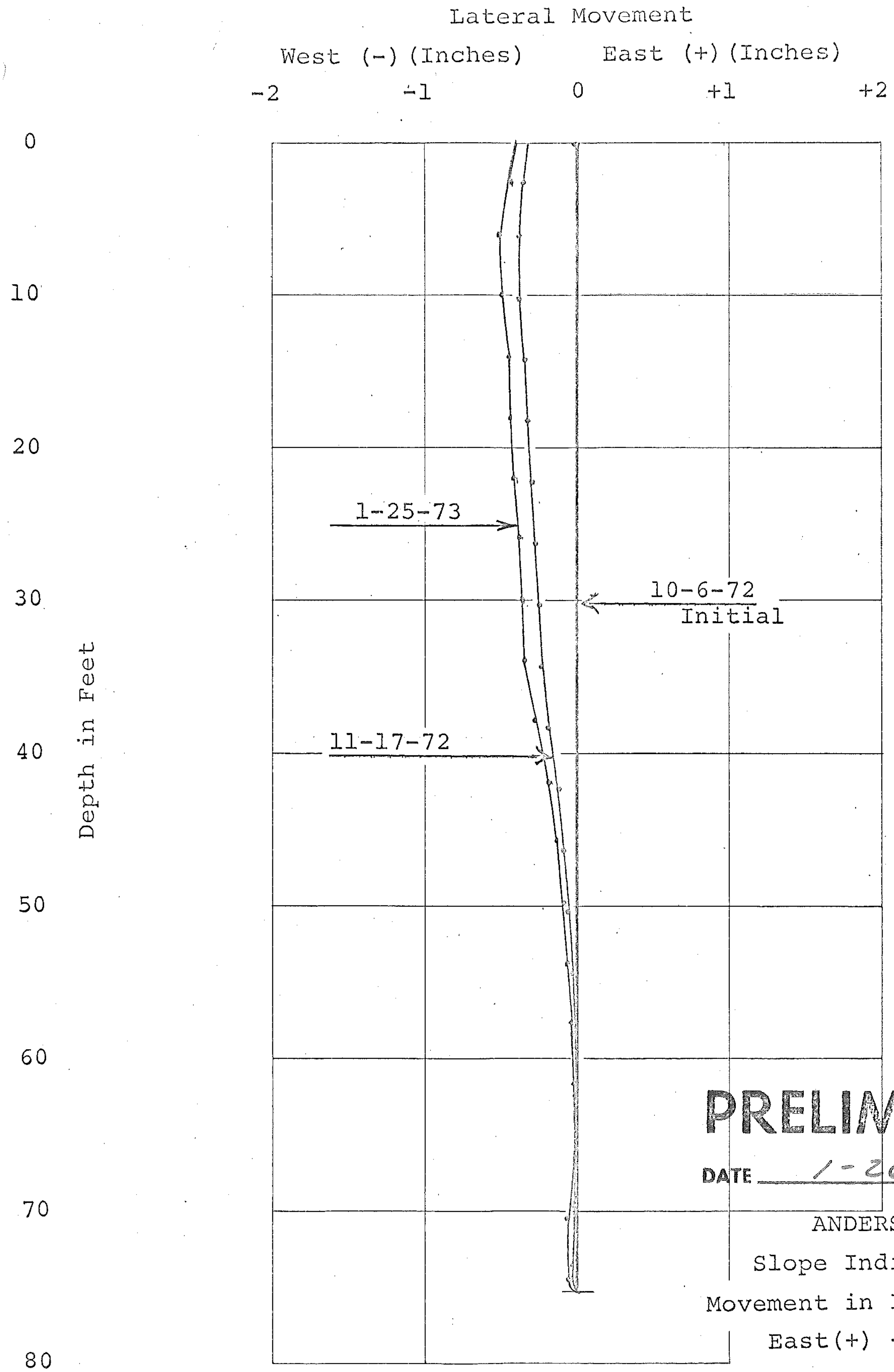
ANDERSON DAM

Slope Indicator SI-1A

Movement in Inches vs Depth

North(+) - South(-)

FIG. 4



PRELIMINARY

DATE 1-26-73

ANDERSON DAM
Slope Indicator SI-1A
Movement in Inches vs Depth
East(+) - West(-)

FIG. 5

Dan Dowers — Gen
Superintendent

First hole water
filled to within 6'
of top
Hole not logged
Sandy clay to 16
Sand (Saturated)
at 16 — [illegible]

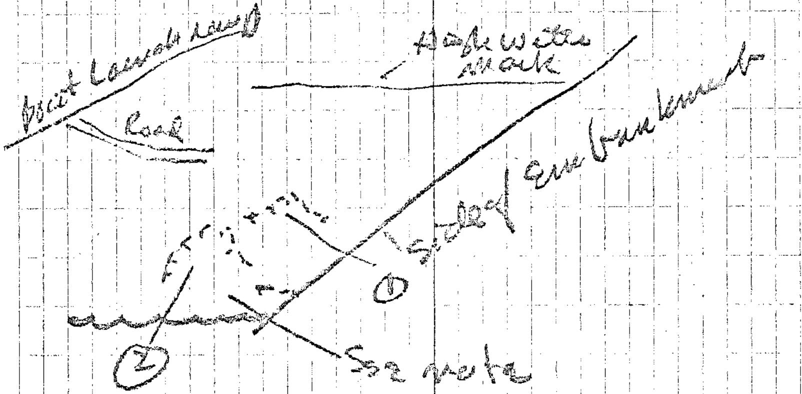
[illegible]
0-2 Fill
0-16 Silty sandy clay
16-18 (2) Sand

18-21 (3) [illegible]

Sept 16, 1992

1

Drove to Anderson Dam
Reservoir level low
took 2 photos at
Dam of landslide
areas below two
slope indicator
installation



Some slope movement appears
to have occurred within
last 2-4 years or perhaps
last year. Distinct
sloughing of material adjacent
to groin of dam

Other photo taken of large landslide mass a couple hundred feet or so from embankment. Boat launching ramp was completely out of water.

① total movement of slide adjacent to dam hard to determine but appears to be about 2½ to 3. Most of which appears to have ~~been~~ occurred previously (some evidence of roadway where material was partly removed several years ago,

② this area appears to have recent movement slide scarp is ~~about~~ between 1-2½ feet with an average of about 1½'. All chaotically mixed material Angular rock fragments in clay matrix.

— At slide across boat launching ramp-

— A considerable amount of material has covered part of the excavation made for the end portion of the ramp. Area now looks considerably different than when photos were taken in 1960

Watson

AGENDA MEMORANDUM

TO: The Board of Directors FROM: Donald K. Currlin

AGENDA DATE: 10/3/72 AGENDA ITEM NO. 5a DEPT. Engineering

ZONE ______ PROJECT NO. 90086 NAME Anderson Reservoir

SUBJECT Expenditure in Excess of $1000, Repair of a Slope Indicator at Anderson Reservoir

EXPLANATION:

The protective covering of a slope indicator at Anderson Reservoir was removed by breaking the lock. The vandals then filled the 75-foot deep casing of the slope indicator with dirt and gravel rendering the hole useless.

An attempt was made by the District's Maintenance Construction Division to remove the dirt and gravel in the hole by washing and jetting with water. It was found to be too difficult for the Maintenance Division to remove the material by this method and with the available equipment.

The material in the hole should be removed or the hole replaced before the fall rains to determine any slope movement during the winter months.

Shannon and Wilson, the firm who supervised installation of the slope indicator, were asked what method should be used to remove the material in the hole. They felt the hole could probably be cleaned by washing with a moderately thick drilling mud entered through small diameter drilling stems. The firm estimated the cost to be between $500 and $2,000 including slope indicator readings which should be made at this time. The lower cost would represent one day's work with a drilling rig and supervision by Shannon and Wilson to remove the material. The higher cost would be to completely replace the hole and casing which would vary between $1,000 and $2,000.

OK'd

RECOMMENDATION: It is recommended that the District hire the firm of Shannon and Wilson to remove the material from the hole. The work should be done on a time and materials basis not to exceed $2,000.

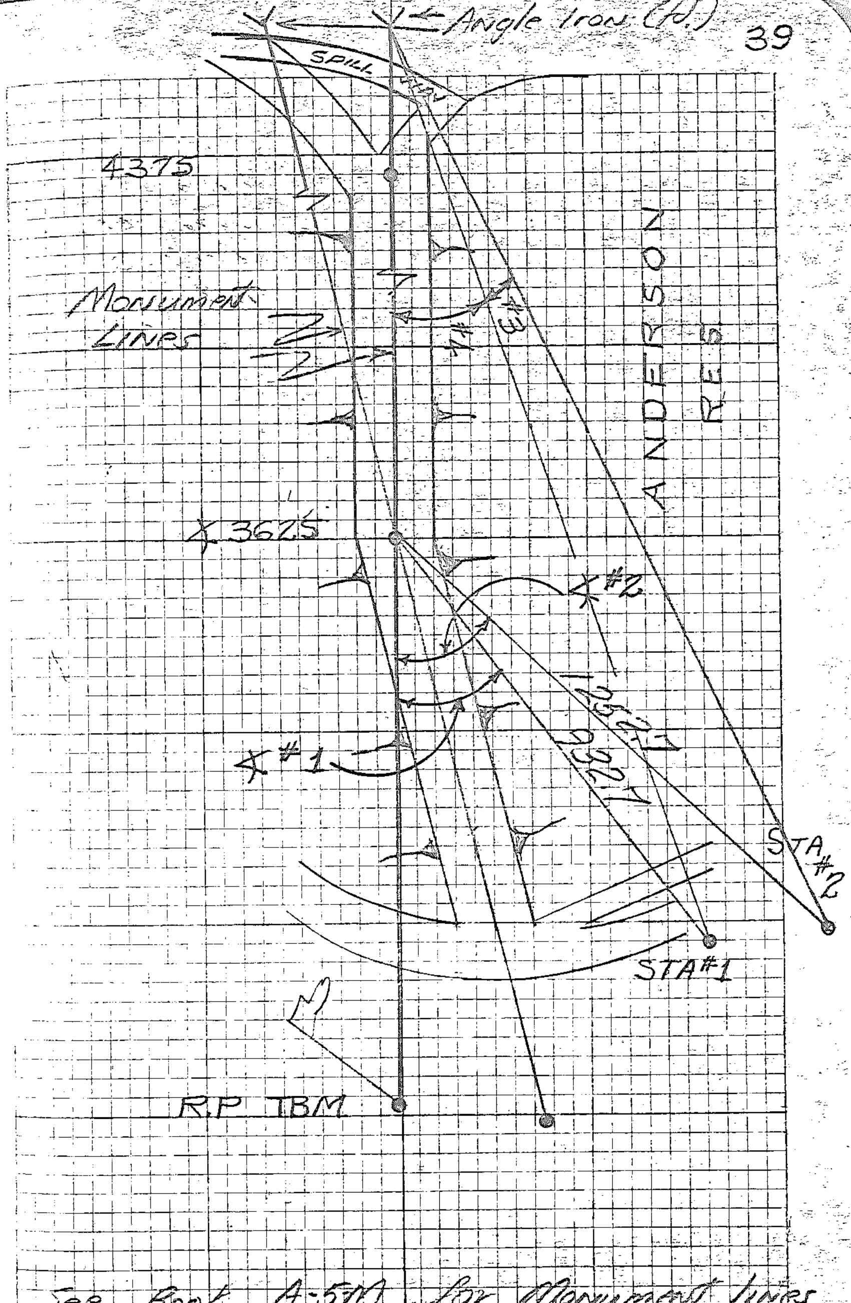
Nov 6, 1972
TAYLOR
QUARTIERO
ARROYO
HILSEN

MEAN
∡#1 65°04'20"

∡#2 77°47'00"

DEC 27, 1972. (MEAN)
∡#3 11°28'03.5"
∡#4 36°27'15"

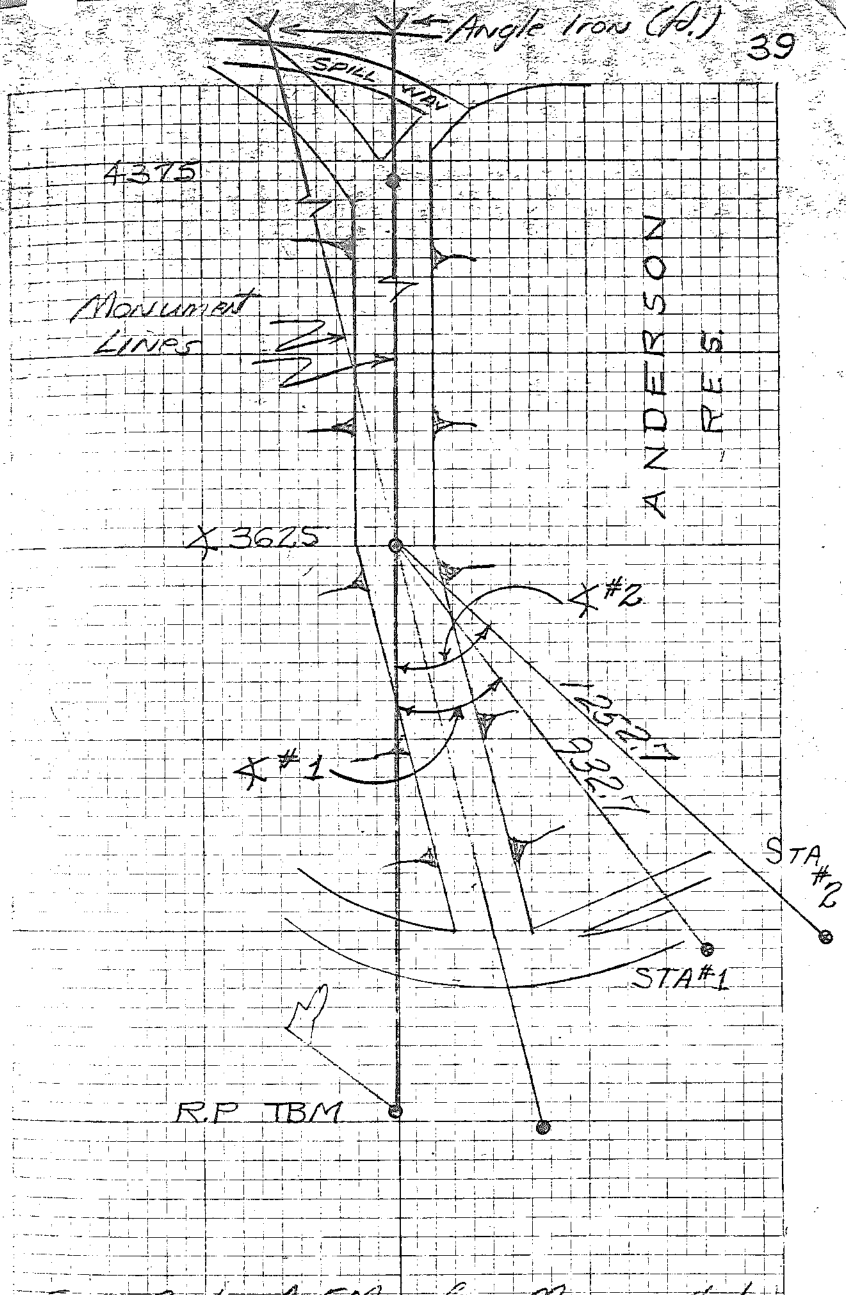
	STA 1	STA 2
DEC 72	1897.65	1991.62



See Book A-5M for Monument Lines

NOV 6, 1972
TAYLOR
QUARTERO
ARROYO
HILSEN

MEAN
∡#1 65°04'20"
∡#2 77°47'05"



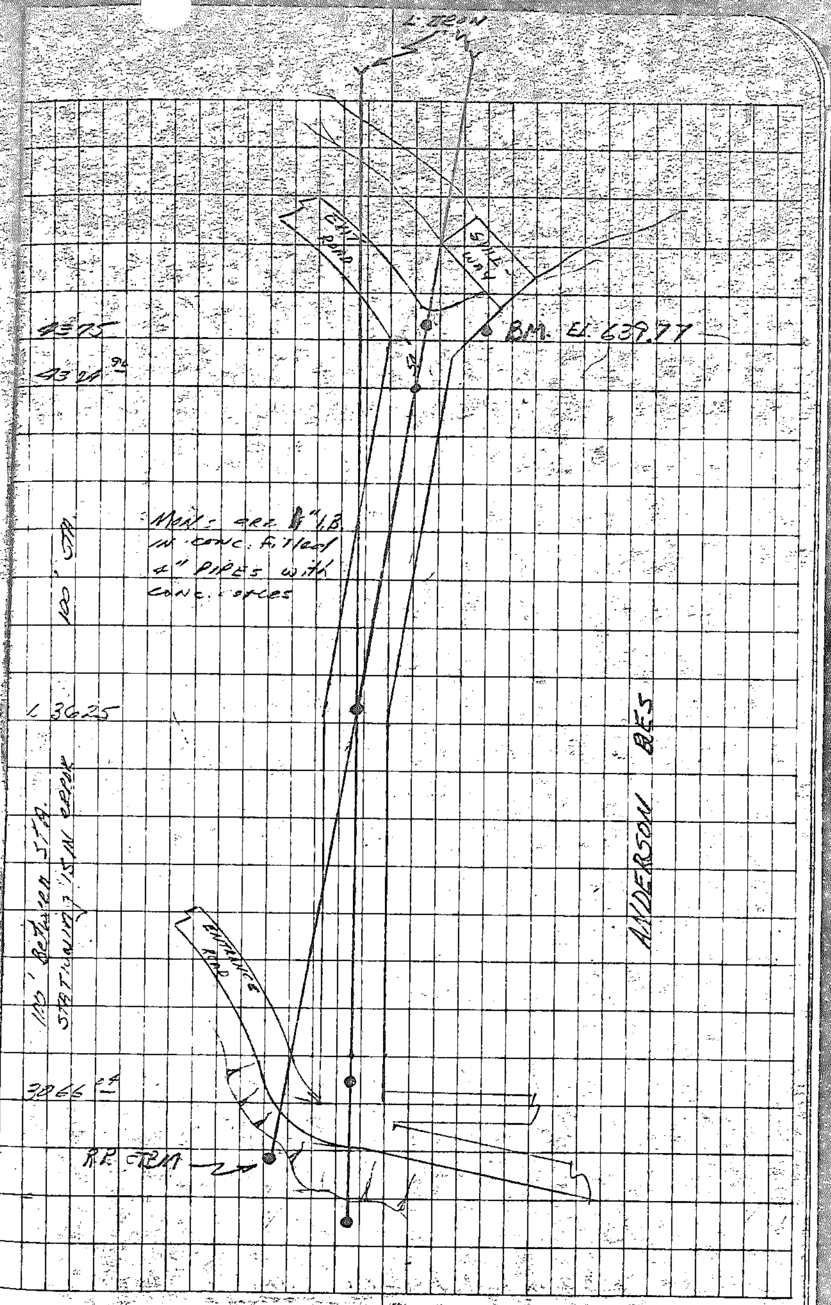
See Book A-5M for Monument lines

Slop

In stak

Cut or Fill

BK A-5-M



SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers

Job No. C-320

Vantine

MEMORANDUM

To: Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attn: ~~Mr~~. James Vantine

Day Friday Date October 13, 1972

☐ Field Inspection Report Page 1 of 1

☐

Project: Anderson Reservoir

Jim:

It has come to our attention that our letter-report dated May 2, 1972, concerning the Slope Indicator installation at Anderson Reservoir, contains an error. The field sheet presenting initial reading data for SI-2 is wrongly headed SI-1. I am including three corrected copies of this sheet. Would you please destroy your copies which are in error and include the corrected copies in your reports.

RDP/meh

By Robert D. Perry

S.C.C.F.C. & W.D.

'72 OCT 16 PM 1:37

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-~~1~~ 2
Corrected October 1972

Anderson Dam C-320
Initial Readings (K=2000)

SHEET 1 OF 1

DATE April 24,1972 INSTR. 200-B-13 READ. RDP CALC. RDP CHKD. DH

DEPTH	DIFF.	AZ. =		DIFF.	CHANGE	DIFF.	AZ. =		DIFF.	CHANGE
		N+	S-				E+	W-		
1		567	538	+29			562	555	+ 7	
2.5		574	544	+30			561	551	+10	
4		572	539	+33			560	553	+ 7	
6		600	512	+88			578	536	+42	
8		601	513	+88			577	535	+42	
10		601	513	+88			577	535	+42	
12		599	513	+86			577	535	+42	
14		600	513	+87			576	535	+41	
16		580	533	+47			560	553	+ 7	
18		580	533	+47			558	555	+ 3	
20		580	533	+47			557	556	+ 1	
22		580	533	+47			555	557	- 2	
24		579	534	+45			555	557	- 2	
26		580	533	+47			557	556	+ 1	
28		581	534	+47			556	555	+ 1	
30		584	526	+58			557	556	+ 1	
32		583	529	+54			556	556	0	
34		583	529	+54			555	557	- 2	
36		588	523	+65			542	570	-28	
38		588	524	+64			543	569	-26	
40		588	524	+64			545	566	-21	
42		587	525	+62			546	566	-20	
44		587	524	+63			547	565	-18	
46		588	524	+64			551	562	-11	
48		588	524	+64			552	560	- 8	
50		590	523	+67			552	560	- 8	
52		587	524	+63			554	559	- 5	
54		588	527	+61			542	566	-24	
56		590	524	+66			545	565	-20	
58		589	524	+65			546	566	-20	
60		587	523	+64			547	566	-19	
62		586	525	+61			550	563	-13	
64		588	525	+63			548	564	-16	
66		576	536	+40			555	557	- 2	
68		576	536	+40			555	557	- 2	
70		578	532	+46			555	558	- 3	
72		579	533	+46			555	558	- 3	
74		578	534	+44			554	559	- 5	

NOTE: All depths referenced to the top of the Slope Indicator casing.

S.C.C.F.C. & W.D.

'72 OCT 16 PM 1:37

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-~~1~~ 2
Corrected October 1972

Anderson Dam C-320
Initial Readings (K=2000)
SHEET 1 OF 1

DATE April 24,1972 INSTR. 200-B-13 READ. RDP CALC. RDP CHKD. DH

DEPTH	DIFF.	AZ.		DIFF.	CHANGE	DIFF.	AZ.		DIFF.	CHANGE
		N+	S-				E+	W-		
1		567	538	+29			562	555	+ 7	
2.5		574	544	+30			561	551	+10	
4		572	539	+33			560	553	+ 7	
6		600	512	+88			578	536	+42	
8		601	513	+88			577	535	+42	
10		601	513	+88			577	535	+42	
12		599	513	+86			577	535	+42	
14		600	513	+87			576	535	+41	
16		580	533	+47			560	553	+ 7	
18		580	533	+47			558	555	+ 3	
20		580	533	+47			557	556	+ 1	
22		580	533	+47			555	557	- 2	
24		579	534	+45			555	557	- 2	
26		580	533	+47			557	556	+ 1	
28		581	534	+47			556	555	+ 1	
30		584	526	+58			557	556	+ 1	
32		583	529	+54			556	556	0	
34		583	529	+54			555	557	- 2	
36		588	523	+65			542	570	-28	
38		588	524	+64			543	569	-26	
40		588	524	+64			545	566	-21	
42		587	525	+62			546	566	-20	
44		587	524	+63			547	565	-18	
46		588	524	+64			551	562	-11	
48		588	524	+64			552	560	- 8	
50		590	523	+67			552	560	- 8	
52		587	524	+63			554	559	- 5	
54		588	527	+61			542	566	-24	
56		590	524	+66			545	565	-20	
58		589	524	+65			546	566	-20	
60		587	523	+64			547	566	-19	
62		586	525	+61			550	563	-13	
64		588	525	+63			548	564	-16	
66		576	536	+40			555	557	- 2	
68		576	536	+40			555	557	- 2	
70		578	532	+46			555	558	- 3	
72		579	533	+46			555	558	- 3	
74		578	534	+44			554	559	- 5	

NOTE: All depths referenced to the top of the Slope Indicator casing.

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-~~1~~ 2
Corrected October 1972

Anderson Dam C-320
Initial Readings (K=2000)

SHEET 1 OF 1

DATE April 24,1972 INSTR. 200-B-13 READ. RDP CALC. RDP CHKD. DH

DEPTH	DIFF.	AZ. = N+	S-	DIFF.	CHANGE	DIFF.	AZ. = E+	W-	DIFF.	CHANGE
1		567	538	+29			562	555	+ 7	
2.5		574	544	+30			561	551	+10	
4		572	539	+33			560	553	+ 7	
6		600	512	+88			578	536	+42	
8		601	513	+88			577	535	+42	
10		601	513	+88			577	535	+42	
12		599	513	+86			577	535	+42	
14		600	513	+87			576	535	+41	
16		580	533	+47			560	553	+ 7	
18		580	533	+47			558	555	+ 3	
20		580	533	+47			557	556	+ 1	
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26		580	533	+47			557	556	+ 1	
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54		588	527	+61			542	566	-24	
56		590	524	+66			545	565	-20	
58		589	524	+65			546	566	-20	
60		587	523	+64			547	566	-19	
62		586	525	+61			550	563	-13	
64		588	525	+63			548	564	-16	
66		576	536	+40			555	557	- 2	
68		576	536	+40			555	557	- 2	
70		578	532	+46			555	558	- 3	
72		579	533	+46			555	558	- 3	
74		578	534	+44			554	559	- 5	

NOTE: All depths referenced to the top of the Slope Indicator casing.

Santa Clara County
FLOOD CONTROL & WATER DISTRICT

PURCHASE REQUEST

PURCHASE ORDER NO. PO 5046

REQUEST NO. PR 7870

DEPT./BRANCH Engineering

DIVISION Water Supply

REQUESTOR E. Watson

DATE Sept. 20, 1972

APPROVAL E Watson

DATE 9-21-72

DATE REQUIRED

S.C. F.C. W.D. SEP 21 3 29 PM '72

SHIP TO: ☒ 5750 ALMADEN EXPRESSWAY ☐ 400 MORE AVE.
☐ 14545 OKA LANE ☐ OUR PICKUP
☐ OTHER

ATTENTION OF:

MATERIAL RECEIVED ☐ YES ☐ NO	F.O.B. Destination, as checked above, unless Origin ☐ indicated.	INVOICE TERMS	BUDGET PAGE NO 274	WORK AUTH NO 190.1.1	FUND NO 772	OBJECT NO. 2	PROG. NO. 2

ITEM NO	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT	ACCOUNT NO	ORG. NO.
	1	JB	For services to remove and clean foreign material from a slope indicator tubing or to redrill and to replace slope indicator located on the left abutment of Anderson Reservoir. Work to be performed on a time and materials basis.	Approx. $500/day	2 ~~hrs.~~ days $1,000	8060	

XED

SPECIAL INSTRUCTIONS

79869-50

VENDOR & ADDRESS Shannon and Wilson, Inc., 1550 Rollins Rd., Burlingame, CA 94010

For Fiscal Use Only

FUNDS AVAILABLE ☒ Yes ☐ No

REMARKS [illegible]

SIGNED F. Shannon

DATE 9/21/72

[illegible] established after the fact.

REQUEST NO. PR 7870

FC 41 (8-27-71) DISTRUBUTION: WHITE-PURCHASING, YELLOW-FISCAL, GOLDENROD-ORIGINATOR, WHITE-EXTRA COPY

PURCHASE ORDER

P.O. No. must appear on all shipping
papers and packages related to this order.

PURCHASE ORDER NO. PO 5046 W

REQUEST NO. PR 7870

Bill to:
Santa Clara County
FLOOD CONTROL & WATER DISTRICT
5750 ALMADEN EXPRESSWAY PHONE (408) 265-2600
SAN JOSE, CALIFORNIA 95118

SHIP TO:
☐ 5750 ALMADEN EXPRESSWAY
SAN JOSE, CAL. 95118
(408) 265-2600

☐ 400 MORE AVE.
LOS GATOS, CAL. 95030
(408) 356-8121

☐ OUR PICK UP

☐ 14545 OKA LANE
LOS GATOS, CAL. 95030

☒ OTHER ______________________________

VENDOR

Shannon and Wilson, Inc.
1550 Rollins Road
Burlingame, Ca. 94010

79869-50 ATT. OF ______________________________

Material has been received ☐ Yes ☒ No
DO NOT DUPLICATE

PROMISED DELIVERY DATE	F.O.B. Destination, as checked above, unless Origin ☐ indicated. VIA	INVOICE TERMS	VENDOR NO.	BUDGET PAGE NO	WORK AUTH NO	FUND NO	OBJECT NO	PROG. NO
				274	190004	2778	2	2

CATEGORY CODE	ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT	ACCOUNT NO	ORG. NO.
XED	1	1	JB	For services to remove and clean foreign material from a slope indicator tubing or to redrill and to replace slope indicator located on the left abutment of Anderson Reservoir. Work to be performed on a time and materials basis. Approx $500.00/day				
				NOT TO EXCEED -------	$2,000.00	$2,000.00	8060	513

CONFIRMING ORDER PLACED WITH:

____
(VENDORS REPRESENTATIVE)

____
PURCHASING AGENT

10/5/72
DATE

PURCHASE ORDER NO. PO 5046

FC 42 (8-27-71) DISTRIBUTION: WHITE-VENDOR, YELLOW-FISCAL, PINK-PURCHASING, GREEN-PURCHASING VENDOR FILE, BLUE-RECEIVING, GOLDENROOD-ORIGINATOR, WHITE-EXTRA COPY

1. Watson
2. file.

memorandum

TO	FROM
Mr. Lloyd C. Fowler	Gene Watson
SUBJECT	**DATE**
Vandalism of a Slope Indicator Located on the Left Abutment of Anderson Reservoir	September 15, 1972

This memorandum is to document vandalism to a newly installed slope indicator on the left abutment of Anderson Reservoir and to suggest recommendations for the correction of the damage. The protective covering of the slope indicator was removed by breaking the lock. The 75-foot deep casing of the slope indicator was then filled completely with dirt and gravel rendering the hole useless. The damage was discovered by the caretaker for Anderson Dam who reported the damage to Bill Wilson of our office.

An attempt was made by the District's Maintenance Construction Division to remove the dirt and gravel in the hole by washing and jetting with water. It was found to be too difficult however for the Maintenance Division to remove the material by this method and with the available equipment.

It is recommended that the material in the hole be removed or the hole replaced before the fall rains to determine the amount of slope movement during the winter months. The hole could be repaired or replaced by hiring a drilling firm such as Pitcher Drilling, who is experienced in drilling and installing slope indicators. Shannon and Wilson, the firm who supervised installation of the slope indicator, were asked what method should be used to remove the material in the hole. They felt the hole could probably be cleaned by washing with water or with using a moderately thick drilling mud entered through small diameter drilling stems. The firm estimated the cost to be between $500 and $2,000 including slope indicator readings which should be made at this time. The lower cost would represent one day's work with a drilling rig and supervision by Shannon and Wilson to remove the material. The higher cost would be to completely replace the hole and casing. Different, vandal proof, caps ~~should~~ will be installed on both holes.

With your approval, I would like to proceed with plans to remove the material in the hole. Since Shannon and Wilson were somewhat optimistic that the hole could be saved, a purchase order could be written for the work to remove the material from the hole. The work should be done on a time and materials basis.

E Watson
Division Engineer
Water Supply Division

JV:kj

Gene -
Have the work done and then prepare a budget transfer to cover the cost of the work when known. LCF

Pat
April 1

John Buedo
322

Questions for Jerry Wire

1) Landslide of 1962 — location
— was it at boat launching ramp.

2)
Apparently slide area of boat ramp was slide in 1962 — Movement in 1969 was new failure area or new scarp development. —

3) Was there any additional movement

4) Amount of maintenance work performed.

— Called John Buedet
Moved building in 1969 —
Made cut below building & pushed material to side — Made slope to existing road.
Dam was originally —

— West end of boat ramp

N.W. End

— John believes it to be one slide —— Could either put

SHANNON & WILSON, INC.
SOIL MECHANICS AND FOUNDATION ENGINEERS
1550 ROLLINS ROAD ● BURLINGAME, CALIFORNIA 94010
TELEPHONE (415) 697-7563

INVOICE NUMBER
499

TO

Santa Clara County Flood Control & Water District,
5750 Almaden Expressway,
San Jose, Calif. 95118.

INVOICE DATE	CONTRACT OR PURCHASE ORDER	AUTHORIZED FEE	JOB NUMBER
5/16/72	PO 3755 PR 7035	$4,800.00	C-320

PROFESSIONAL SERVICES

ENGINEERING SERVICES			831.62
REIMBURSABLE EXPENSES	Slope Indicator Co.	444.73	
	Pitcher Drilling	1704.33	
	RDP Expenses	11.08	
	Mileage	87.24	
	Rental SINCO Instr.	25.00	
	Sales Tax	1.25	2,273.63
TOTALS			$3,105.25
	Agreed Sum for Installation		$3,000.00

I hereby certify that amounts invoiced herein do not exceed the lower of (1) the contract price, or (2) maximum levels established in accordance with Executive Order 11615, dated August 15, 1971, as superseded by Executive Order 11627, dated October 15, 1971.

THIS PERIOD: FROM 4/1/72 TO 4/29/72

☒ PROGRESS INVOICE ☐ FINAL INVOICE

JOB REFERENCE:

Installation of Inclinometers,
Anderson Reservoir,
Santa Clara County.

TERMS: NET 30 DAYS. PLEASE PAY FROM THIS INVOICE. STATEMENTS SENT ONLY UPON REQUEST.

SANTA CLARA COUNTY
FLOOD CONTROL AND
WATER DISTRICT
'72 MAY 17 PM 1:27

S.C.C.F.C.&W.D.
FISCAL DIVISION
MAY 17 2 37 PM '72

5-3

Watson

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

May 2, 1972

Santa Clara County Flood Control
and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine

Re: Slope Indicator
Installation
Anderson Reservoir

Gentlemen:

This letter presents the results of the installation of two Slope Indicator casings in the vicinity of Anderson Dam, Santa Clara County, California. Also included are the initial readings for both casings. This work was authorized by Mr. E. Watson in his letter dated April 4, 1972, and was performed under Purchase Order No. 3755.

Field work was started on April 17, 1972, and completed on April 24, 1972. Both installations are located on the large complex slide area immediately northeast of the left abutment of the dam. The installation sites were located in the field by Mr. James Vantine, and access to the sites was provided by the Maintenance and Construction Division of the Santa Clara County Flood Control and Water District. We understand the District will establish as-drilled location and elevation for each installation. Figure 1 shows approximate locations of the installations.

The drilling was accomplished under subcontract to the J.N. Pitcher Drilling Company of Daly City, California. The borings were advanced with truck-mounted rotary drilling equipment and were observed by a geologist from Shannon & Wilson, Inc.

SI-1 was drilled to a depth of 77 feet below the existing ground surface. The materials encountered in the hole were sheared serpentine with scattered blocks of greenstone. A very hard mass of greenstone was encountered at a depth of 38 feet and deflected the drill hole to the northeast. Consequently, the boring had to be redrilled using a larger bit in conjunction with a drill collar in order to straighten the hole. Slope Indicator casing was installed in the hole to a depth of 75 feet below the surface.

Seattle • Spokane • Portland • San Francisco (Burlingame)

William L. Shannon, P.E. • Stanley D. Wilson, P.E. • Earl A. Sibley, P.E. • Walter L. Wright, P.E. • Rudy J. Dietrich, P.E.

SI-2 was also drilled to a depth of 77 feet below existing ground surface. The material encountered in the hole was a sheared greenstone with varying amounts of a red-brown plastic clay. A soft zone with a high clay content was encountered at the 55 to 61-foot depth. Slope Indicator casing was installed in the hole to a depth of 74.5 feet below the ground surface.

In both installations, 3.19-inch O.D. aluminum Slope Indicator casing was used. The hole was drilled to approximate installation depth utilizing fluid to stabilize the hole and return cuttings to the surface. The fluid was bailed out of the hole prior to installation of the casing. SI-1 was bailed dry. SI-2, however, was making water below the 50-foot depth and was impractical to bail dry. The borings were backfilled with pea-gravel. The pea-gravel was densified by means of an air-driven vibrator suspended within the Slope Indicator casing.

The grooves in the casing controlling the orientation of the instrument have been set so that the north-south grooves are parallel to the expected direction of movement. In both cases, the north groove is on the downslope side.

Upon completion of casing installation, initial readings were obtained with the Slope Indicator instrument. All subsequent readings will be compared to the initial readings to determine casing deflection. The initial set of readings is included for your information and records.

We understand that the present rate of movement (if any) of the slide area is unknown. We, therefore, recommend Slope Indicator readings at relatively frequent intervals until movement trends are established. We recommend that a set of readings be obtained in mid-summer and another later in the year before the heavy rains. More frequent readings during periods of heavy rain may also be required.

We appreciate working with you on this project and look forward to the continued monitoring of the slide area. Please advise if you have any questions or require any further information.

Very truly yours,

SHANNON & WILSON, INC.

By Rudy J. Dietrich
Rudy J. Dietrich

RJD/meh

S.C.C.F.C. & W.D.
GENERAL SVCS. DIV.

'72 MAY 3 PM 2:44

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-1

Anderson Dam C-320

SHEET 1 OF 1

Initial Readings (K=2000)

DATE April 21,1972 INSTR 200-B-13 READ RDP CALC RDP CHKD DH

DEPTH	DIFF.	AZ.		DIFF.	CHANGE	DIFF.	AZ.		DIFF.	CHANGE
		N+	S-				E+	W-		
1		520	596	- 76			609	502	+107	
2.5		520	593	- 73			609	506	+103	
4		520	593	- 73			609	507	+102	
6		514	601	- 87			580	534	+ 46	
8		514	601	- 87			582	533	+ 49	
10		514	601	- 87			583	532	+ 51	
12		514	601	- 87			583	532	+ 51	
14		513	602	- 89			583	531	+ 52	
16		508	606	- 98			561	553	+ 8	
18		508	606	- 98			563	552	+ 11	
20		507	607	-100			563	551	+ 12	
22		508	608	-100			555	556	- 1	
24		507	607	-100			556	558	- 2	
26		494	619	-125			582	534	+ 48	
28		494	620	-126			583	532	+ 51	
30		494	621	-127			586	529	+ 57	
32		493	621	-128			588	526	+ 62	
34		495	621	-126			588	525	+ 63	
36		488	625	-137			582	533	+ 49	
38		489	625	-136			583	532	+ 51	
40		488	625	-137			582	532	+ 50	
42		489	625	-136			583	531	+ 52	
44		489	625	-136			584	530	+ 54	
46		487	628	-141			563	551	+ 12	
48		487	628	-141			565	548	+ 17	
50		487	628	-141			565	548	+ 17	
52		486	629	-143			566	548	+ 18	
54		486	629	-143			565	548	+ 17	
56		488	625	-137			564	551	+ 13	
58		489	625	-136			563	551	+ 12	
60		489	625	-136			567	548	+ 19	
62		491	624	-133			567	547	+ 20	
64		491	624	-133			565	549	+ 16	
66		510	605	- 95			570	544	+ 26	
68		509	604	- 95			567	546	+ 21	
70		509	606	- 97			566	548	+ 18	
72		509	606	- 97			564	550	+ 14	
74		509	605	- 96			563	552	+ 11	

NOTE: All depths referenced to the top of the Slope Indicator casing.

THE SLOPE INDICATOR CO.

FIELD SHEET

SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-1

Anderson Dam C-320

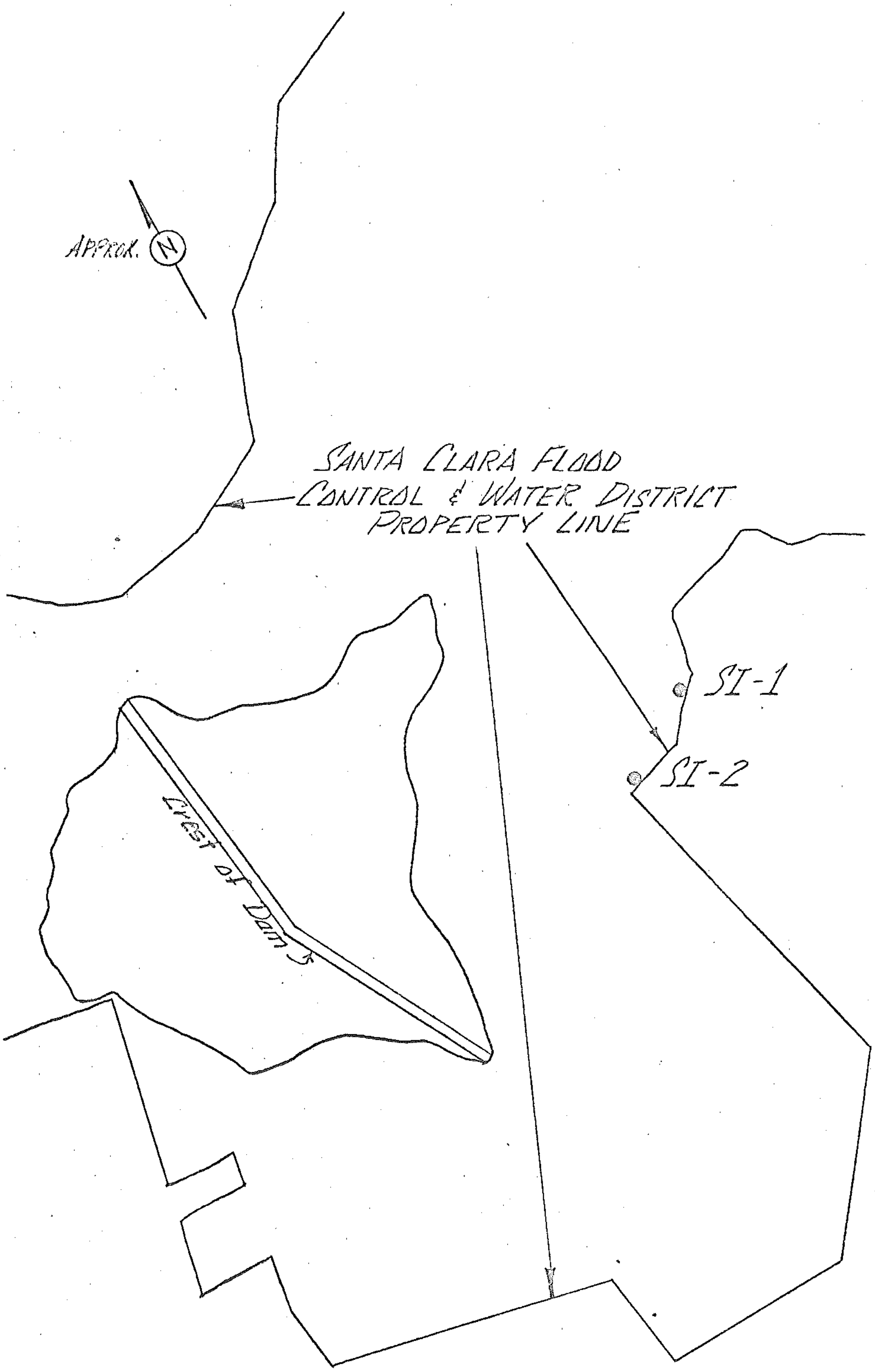
Initial Readings (K=2000)

SHEET 1 OF 1

DATE April 24,1972 INSTR. 200-B-13 READ. RDP CALC. RDP CHKD. DH

DEPTH	DIFF.	AZ. =		DIFF.	CHANGE	DIFF.	AZ. =		DIFF.	CHANGE
		N+	S-				E+	W-		
1		567	538	+29			562	555	+ 7	
2.5		574	544	+30			561	551	+10	
4		572	539	+33			560	553	+ 7	
6		600	512	+88			578	536	+42	
8		601	513	+88			577	535	+42	
10		601	513	+88			577	535	+42	
12		599	513	+86			577	535	+42	
14		600	513	+87			576	535	+41	
16		580	533	+47			560	553	+ 7	
18		580	533	+47			558	555	+ 3	
20		580	533	+47			557	556	+ 1	
22		580	533	+47			555	557	- 2	
24		579	534	+45			555	557	- 2	
26		580	533	+47			557	556	+ 1	
28		581	534	+47			556	555	+ 1	
30		584	526	+58			557	556	+ 1	
32		583	529	+54			556	556	0	
34		583	529	+54			555	557	- 2	
36		588	523	+65			542	570	-28	
38		588	524	+64			543	569	-26	
40		588	524	+64			545	566	-21	
42		587	525	+62			546	566	-20	
44		587	524	+63			547	565	-18	
46		588	524	+64			551	562	-11	
48		588	524	+64			552	560	- 8	
50		590	523	+67			552	560	- 8	
52		587	524	+63			554	559	- 5	
54		588	527	+61			542	566	-24	
56		590	524	+66			545	565	-20	
58		589	524	+65			546	566	-20	
60		587	523	+64			547	566	-19	
62		586	525	+61			550	563	-13	
64		588	525	+63			548	564	-16	
66		576	536	+40			555	557	- 2	
68		576	536	+40			555	557	- 2	
70		578	532	+46			555	558	- 3	
72		579	533	+46			555	558	- 3	
74		578	534	+44			554	559	- 5	

NOTE: All depths referenced to the top of the Slope Indicator casing.



NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR
CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION

LOCATION SKETCH

SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIG. 1

S.C.C.F.C. & W.D.
GENERAL SVCS. DIV.

'72 MAY 3 PM 2:44

#		INIT	1972	INFO	ACT
	CURRLIN				
	FOWLER				
	ESAU				
	WILSON				
	ENANDER				
	HOLLEY				
	HENLEY				

#	ENG.	INIT	1972	INFO	ACT	#	P.S.	INIT	1972	INFO	ACT	#	A.&F.	INIT	1972	INFO	ACT
	FOWLER						ESAU						DIRECTOR				
	BEAUDET						LAWRIE						ASST.DIR.				
	KORBAY						SULLIVAN						AD.ASST.				
	GARRETT						GILL						D.P.OPER.				
	WATKINS												D.P.MIDS				
	ROMAN												FISCAL				
	RICHARDSON												SEC.SER.				
	WATSON												WTR.USE				
	CLARKE												GEN.SER.				
	ALLEN																
1	Vantine																

copies to LCF RA

THE ORIGINAL OF THIS LETTER IS IN CENTRAL FILES. PLEASE RETURN THIS COPY TO CENTRAL FILES ONLY IF THERE ARE ENCLOSURES OR ATTACHMENTS.

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

May 2, 1972

Santa Clara County Flood Control
  and Water District
5750 Almaden Expressway
San Jose, California 95118

Attention: Mr. James Vantine

Re: Slope Indicator
Installation
Anderson Reservoir

Gentlemen:

This letter presents the results of the installation of two Slope Indicator casings in the vicinity of Anderson Dam, Santa Clara County, California. Also included are the initial readings for both casings. This work was authorized by Mr. E. Watson in his letter dated April 4, 1972, and was performed under Purchase Order No. 3755.

Field work was started on April 17, 1972, and completed on April 24, 1972. Both installations are located on the large complex slide area immediately northeast of the left abutment of the dam. The installation sites were located in the field by Mr. James Vantine, and access to the sites was provided by the Maintenance and Construction Division of the Santa Clara County Flood Control and Water District. We understand the District will establish as-drilled location and elevation for each installation. Figure 1 shows approximate locations of the installations.

The drilling was accomplished under subcontract to the J.N. Pitcher Drilling Company of Daly City, California. The borings were advanced with truck-mounted rotary drilling equipment and were observed by a geologist from Shannon & Wilson, Inc.

SI-1 was drilled to a depth of 77 feet below the existing ground surface. The materials encountered in the hole were sheared serpentine with scattered blocks of greenstone. A very hard mass of greenstone was encountered at a depth of 38 feet and deflected the drill hole to the northeast. Consequently, the boring had to be redrilled using a larger bit in conjunction with a drill collar in order to straighten the hole. Slope Indicator casing was installed in the hole to a depth of 75 feet below the surface.

Seattle • Spokane • Portland • San Francisco (Burlingame)

William L. Shannon, P.E. • Stanley D. Wilson, P.E. • Earl A. Sibley, P.E. • Walter L. Wright, P.E. • Rudy J. Dietrich, P.E.

SI-2 was also drilled to a depth of 77 feet below existing ground surface. The material encountered in the hole was a sheared greenstone with varying amounts of a red-brown plastic clay. A soft zone with a high clay content was encountered at the 55 to 61-foot depth. Slope Indicator casing was installed in the hole to a depth of 74.5 feet below the ground surface.

In both installations, 3.19-inch O.D. aluminum Slope Indicator casing was used. The hole was drilled to approximate installation depth utilizing fluid to stabilize the hole and return cuttings to the surface. The fluid was bailed out of the hole prior to installation of the casing. SI-1 was bailed dry. SI-2, however, was making water below the 50-foot depth and was impractical to bail dry. The borings were backfilled with pea-gravel. The pea-gravel was densified by means of an air-driven vibrator suspended within the Slope Indicator casing.

The grooves in the casing controlling the orientation of the instrument have been set so that the north-south grooves are parallel to the expected direction of movement. In both cases, the north groove is on the downslope side.

Upon completion of casing installation, initial readings were obtained with the Slope Indicator instrument. All subsequent readings will be compared to the initial readings to determine casing deflection. The initial set of readings is included for your information and records.

We understand that the present rate of movement (if any) of the slide area is unknown. We, therefore, recommend Slope Indicator readings at relatively frequent intervals until movement trends are established. We recommend that a set of readings be obtained in mid-summer and another later in the year before the heavy rains. More frequent readings during periods of heavy rain may also be required.

We appreciate working with you on this project and look forward to the continued monitoring of the slide area. Please advise if you have any questions or require any further information.

Very truly yours,
SHANNON & WILSON, INC.

By Rudy J Dietrich
Rudy J. Dietrich

RJD/meh

S.C.C.F.C. & W.D.
GENERAL SVCS. DIV.

'72 MAY 3 PM 2:44

THE SLOPE INDICATOR CO.

FIELD SHEET

SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-1

Anderson Dam C-320

Initial Readings (K=2000)

SHEET 1 OF 1

DATE April 21,1972 INSTR 200-B-13 READ RDP CALC RDP CHKD DH

DEPTH	DIFF.	AZ =		DIFF.	CHANGE	DIFF.	AZ =		DIFF.	CHANGE
		N+	S-				E+	W-		
1		520	596	- 76			609	502	+107	
2.5		520	593	- 73			609	506	+103	
4		520	593	- 73			609	507	+102	
6		514	601	- 87			580	534	+ 46	
8		514	601	- 87			582	533	+ 49	
10		514	601	- 87			583	532	+ 51	
12		514	601	- 87			583	532	+ 51	
14		513	602	- 89			583	531	+ 52	
16		508	606	- 98			561	553	+ 8	
18		508	606	- 98			563	552	+ 11	
20		507	607	-100			563	551	+ 12	
22		508	608	-100			555	556	- 1	
24		507	607	-100			556	558	- 2	
26		494	619	-125			582	534	+ 48	
28		494	620	-126			583	532	+ 51	
30		494	621	-127			586	529	+ 57	
32		493	621	-128			588	526	+ 62	
34		495	621	-126			588	525	+ 63	
36		488	625	-137			582	533	+ 49	
38		489	625	-136			583	532	+ 51	
40		488	625	-137			582	532	+ 50	
42		489	625	-136			583	531	+ 52	
44		489	625	-136			584	530	+ 54	
46		487	628	-141			563	551	+ 12	
48		487	628	-141			565	548	+ 17	
50		487	628	-141			565	548	+ 17	
52		486	629	-143			566	548	+ 18	
54		486	629	-143			565	548	+ 17	
56		488	625	-137			564	551	+ 13	
58		489	625	-136			563	551	+ 12	
60		489	625	-136			567	548	+ 19	
62		491	624	-133			567	547	+ 20	
64		491	624	-133			565	549	+ 16	
66		510	605	- 95			570	544	+ 26	
68		509	604	- 95			567	546	+ 21	
70		509	606	- 97			566	548	+ 18	
72		509	606	- 97			564	550	+ 14	
74		509	605	- 96			563	552	+ 11	

NOTE: All depths referenced to the top of the Slope Indicator casing.

THE SLOPE INDICATOR CO.
FIELD SHEET
SLOPE INDICATOR DATA

OBSERVATION WELL NO. SI-1

Anderson Dam C-320
Initial Readings (K=2000)

SHEET 1 OF 1

DATE April 24,1972 INSTR. 200-B-13 READ. RDP CALC. RDP CHKD. DH

DEPTH	DIFF.	AZ =		DIFF.	CHANGE	DIFF.	AZ =		DIFF.	CHANGE
		N+	S-				E+	W-		
1		567	538	+29			562	555	+ 7	
2.5		574	544	+30			561	551	+10	
4		572	539	+33			560	553	+ 7	
6		600	512	+88			578	536	+42	
8		601	513	+88			577	535	+42	
10		601	513	+88			577	535	+42	
12		599	513	+86			577	535	+42	
14		600	513	+87			576	535	+41	
16		580	533	+47			560	553	+ 7	
18		580	533	+47			558	555	+ 3	
20		580	533	+47			557	556	+ 1	
22		580	533	+47			555	557	- 2	
24		579	534	+45			555	557	- 2	
26		580	533	+47			557	556	+ 1	
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32		583	529	+54			556	556	0	
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36		588	523	+65			542	570	-28	
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46		588	524	+64			551	562	-11	
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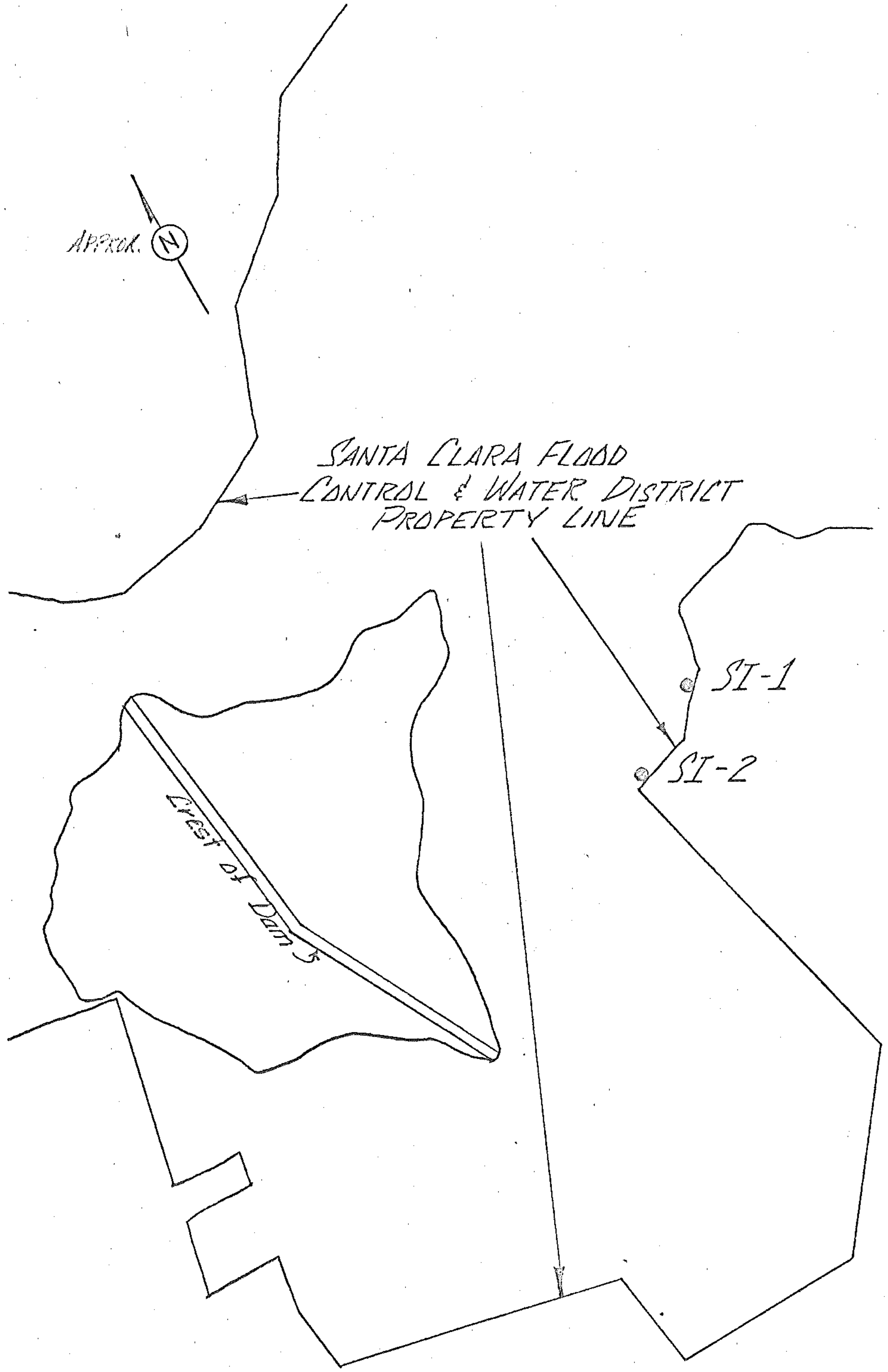
50		590	523	+67			552	560	- 8	
52		587	524	+63			554	559	- 5	
54		588	527	+61			542	566	-24	
56		590	524	+66			545	565	-20	
58		589	524	+65			546	566	-20	
60		587	523	+64			547	566	-19	
62		586	525	+61			550	563	-13	
64		588	525	+63			548	564	-16	
66		576	536	+40			555	557	- 2	
68		576	536	+40			555	557	- 2	
70		578	532	+46			555	558	- 3	
72		579	533	+46			555	558	- 3	
74		578	534	+44			554	559	- 5	

NOTE: All depths referenced to the top of the Slope Indicator casing.



NOTE: DRAWING NOT TO SCALE.
LOCATION OF SLOPE INDICATOR CASINGS ARE SCHEMATIC ONLY.

ANDERSON DAM
SLOPE INDICATOR INSTALLATION

LOCATION SKETCH

SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

FIG. 1

S.C.C.F.C. & W.D.
GENERAL SVCS. DIV.

'72 MAY 3 PM 2:44

Watson

AGENDA MEMORANDUM

TO: The Board of Directors FROM: Donald K. Currlin

AGENDA DATE: 3/28/72 AGENDA ITEM NO. 6 DEPT. Engineering

ZONE PROJECT NO. 90086 NAME Anderson Reservoir

SUBJECT Authorization to Hire Consultant to Install and Monitor Tiltmeters at Anderson Reservoir

EXPLANATION:

The slide near the left abutment of Anderson Dam should be monitored for potential movement. Movement of this mass could result in damage to the intake structure at the upstream toe of the Dam.

The firm of Shannon and Wilson Inc., of Burlingame, specializes in this type of work and would install two tiltmeters in the slide area for a not to exceed price of $3,000. This price includes use of specialized equipment which will remain the property of the firm. In addition, the proposal calls for the firm to monitor these instruments semi-annually at a cost of $500 per year. If movement is noted more frequent monitoring may be required at a cost of $250 per measurement.

OK'd

RECOMMENDATION:

It is recommended that the firm of Shannon and Wilson be hired to do the work.

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

SANTA CLARA COUNTY
FLOOD CONTROL AND
WATER DISTRICT
13 AM 10 06

March 10, 1972

Santa Clara County Flood Control
and Water District
513 East Martha
San Jose, California 95112

Attention: Mr. James Vantine

Re: Slope Indicator
Installation
Anderson Reservoir

Gentlemen:

We are pleased to submit our proposal for the installation of two Slope Indicators in the vicinity of Anderson Reservoir in Santa Clara County, California. Mr. James Vantine has verbally described the site to us and furnished us with a Santa Clara County Flood Control and Water District report entitled, "Landslides at Anderson Reservoir", 1971.

The Slope Indicators would be installed on the large landslide on the left abutment of the dam. This landslide is described as a rotational type slide with an average depth of about 30 feet. The landslide occurs in sheared, weathered serpentine.

Enclosed is a brochure which describes the operations and various applications of the Series 200-B Slope Indicator.

The scope of our proposal includes furnishing all the necessary materials for two Slope Indicator installations to a depth of approximately 75 feet below existing ground surface. Also included is the drilling of the holes installation of the Slope Indicator casing and the taking of initial readings.

We assume that access will be provided to the drill holes which is suitable for truck-mounted drilling equipment.

Our fee for the installation will be based on time, materials, and expenses in accordance with the attached schedule. We estimate that the cost of our services will range between $2,500 and $3,000, and we agree not to exceed the latter amount without your prior authorization.

Seattle • Spokane • Portland • San Francisco (Burlingame)
William L. Shannon, P.E. • Stanley D. Wilson, P.E. • Earl A. Sibley, P.E. • Walter L. Wright, P.E. • Rudy J. Dietrich, P.E.

In addition, we propose to take individual sets of readings semi-annually or as requested. We would take readings in the field, analyze the data in our office, and submit a letter-report summarizing the results. We estimate that the cost of a set of readings and submission of a letter-report will range between $250.00 and $300.00

We are able to begin installation procedures within a week after your authorization depending on the availability of a drilling subcontractor.

We appreciate the opportunity to submit this proposal and trust it will be favorably considered. Please advise if you have any questions or require further information.

Very truly yours,

SHANNON & WILSON, INC.

By Rudy J Dietrich
Rudy J. Dietrich

RJD/meh

Enclosure: Fee Schedule
Slope Indicator Company Brochure

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
1550 Rollins Road • Suite F • Burlingame, California 94010 • Telephone: (415) 697-7563

March 10, 1972

Santa Clara County Flood Control
and Water District
513 East Martha
San Jose, California 95112

Attention: Mr. James Vantine

Re: Slope Indicator
Installation
Anderson Reservoir

Gentlemen:

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Enclosed is a brochure which describes the operations and various applications of the Series 200-B Slope Indicator.

The scope of our proposal includes furnishing all the necessary materials for two Slope Indicator installations to a depth of approximately 75 feet below existing ground surface. Also included is the drilling of the holes installation of the Slope Indicator casing and the taking of initial readings.

We assume that access will be provided to the drill holes which is suitable for truck-mounted drilling equipment.

Our fee for the installation will be based on time, materials, and expenses in accordance with the attached schedule. We estimate that the cost of our services will range between $2,500 and $3,000, and we agree not to exceed the latter amount without your prior authorization.

Seattle • Spokane • Portland • San Francisco (Burlingame)

William L. Shannon, P.E. • Stanley D. Wilson, P.E. • Earl A. Sibley, P.E. • Walter L. Wright, P.E. • Rudy J. Dietrich, P.E.

SANTA CLARA COUNTY
FLOOD CONTROL AND
WATER DISTRICT

'72 MAR 13 AM 9:00

In addition, we propose to take individual sets of readings semi-annually or as requested. We would take readings in the field, analyze the data in our office, and submit a letter-report summarizing the results. We estimate that the cost of a set of readings and submission of a letter-report will range between $250.00 and $300.00

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Very truly yours,

SHANNON & WILSON, INC.

By
Rudy J. Dietrich

RJD/meh

Enclosure: Fee Schedule
Slope Indicator Company Brochure

'72 MAR 13 AM 8:00
SANTA CLARA COUNTY
FLOOD CONTROL AND
WATER DISTRICT

SANTA CLARA COUNTY
FLOOD CONTROL AND
WATER DISTRICT
'72 MAR 13 AM 9:00

Attachment to proposal dated March 10,1972

to Santa Clara County Flood Control and Water District

FEES FOR SERVICES

SHANNON & WILSON, INC.
Soil Mechanics and Foundation Engineers
Geologists and Geophysicists

January 1972

PROFESSIONAL SERVICES BY STAFF AND PRINCIPALS

Fees for services are based on the time expended on the project by professional, technical and clerical personnel. The fee will be computed by multiplying by two and one-half (2.5) the payroll cost charged to the project. The payroll cost will consist of the employees' salaries charged to the project plus twelve percent for payroll taxes and benefits.

REIMBURSABLE EXPENSES

The following items of expense will be billed at our direct cost or as indicated:

1) Transportation and subsistence expenses incurred for necessary out of town travel by personnel.
2) Shipping charges for samples, field test equipment, etc.
3) Long distance telephone calls, telegrams and cables.
4) Transportation to and from jobs located outside the corporate limits of Seattle, Spokane, Portland and Burlingame:
    a) For use of personal or Company vehicles at $0.12 per mile.
    b) For use of rental cars, trucks, boats, airplanes or other means of transportation at our cost.
5) Explosives, recording film, and other supplies expended in geophysical surveys.
6) Piezometers, observation wells, settlement plates, or other items expended in the investigation.
7) Reproduction of drawings and report.
8) Computer service charges.

BORINGS, GEOPHYSICAL SURVEYS, AND OTHER EXPLORATIONS

Borings, geophysical surveys, pile loading tests, plate bearing tests, and other field tests conducted using our equipment and personnel will be billed to you at the cost of labor, which will be included under engineering services, plus the rental of equipment at rates shown on the attached equipment rental schedule, and other reimbursable expenses. Where deeper borings and other explorations and tests are required which we cannot perform, we will engage a reputable contractor or contractors experienced in this work. The contractor's invoices plus a 10% handling charge will be added to our fee.

RIGHT-OF-ENTRY

Unless otherwise agreed, you will furnish right-of-entry on the land for us to make planned borings, surveys and other explorations. We will take reasonable precautions to minimize damage to the land from use of equipment, but have not included in our fee the cost for restoration of damage which may result from our operations. If you desire us to restore the land to its former condition, we will accomplish this and add the cost to our fee.

SAMPLES

All samples of soil and rock will be destroyed 30 days after submission of our report unless you advise us otherwise. Upon request, we will deliver samples to you, charges collect, or we will store them for you for an agreed storage charge.

SERVICES BY OTHERS

On occasion specialized services by consultants or other technical companies may be needed. One of these is The Slope Indicator Company, in which some of the principals of Shannon & Wilson have an interest. When considered necessary, this firm or other consultants may be utilized with your approval, and the cost of such services will be included in our invoice without markup.

INVOICES

Invoices will be submitted once a month for services performed during the prior month. Payment will be due within 30 days of receipt of invoice. Interest will be added to accounts in arrears at the rate of one percent for each month of delinquency.

WORKMEN'S COMPENSATION INSURANCE

We are protected by Workmen's Compensation Insurance (and/or Employers Liability Insurance) as required by the applicable state statute.

PUBLIC LIABILITY INSURANCE

This paragraph relates only to Public Liability and not Professional Liability. We are protected by Public Liability Insurance for bodily injury and property damage with a combined limit of $1,000,000.00 per occurrence and will furnish certificates therefor on request. Within the limits of said insurance, we agree to save you harmless from and against loss, damage, injury or liability arising directly from the negligent acts or omissions of ourselves, our employees, agents, subcontractors and their employees and agents. If your contract or purchase order places greater responsibilities upon us or requires further insurance coverage, we, if specifically directed by you, will take out additional insurance (if procurable) to protect us, at your expense; but we shall not be repsonsible for property damage from any cause, including fire and explosion, beyond the amounts and coverage of our insurance.

LIMITATION OF PROFESSIONAL LIABILITY

This paragraph relates only to Professional Liability and not Public Liability. In performing our professional services, we will use that degree of care and skill ordinarily exercised under similar circumstances by members of our profession. No warranty, express or implied, is made or intended by our proposal for consulting services, by our furnishing oral or written reports, or by our inspection of work. However, should we or any of our professional employees be found to have been negligent in the performance of professional services or to have made and breached any express or implied warranty, you agree that the maximum aggregate amount of your recovery against us and/or said professional employees shall be limited to $50,000.00 or the amount of the fee paid us for professional services as computed under the first paragraph of this schedule, whichever amount is greater.

①

5-4

Ed Imhoff, Hydrologist

J. Robert Roll, Chief Engineer

Mar. 19, 1962

New Landslide at Anderson Reservoir (Inspected March 17, 18, 1962).

Location of Slide: Below the concession stand on the reservoir slope above the inlet structure, between elevations of 600 and 500 feet.

History of Movement:

(Date)	(Extent of Movement)
Origin–March 7, 1962	1 inch crack at head
March 8, "	2 inch crack at head
March 9, "	3-4 inch crack at head
March 10, "	1 foot downward and outward separation at head
March 11-17, '62	6 to 7 feet total downward and outward separation at head

Size of Slide: Shape is roughly rectangular. Dimensions are about 200 feet across and 300 feet in direction of flow. Depth is unknown but is likely to exceed 50 feet from ground surface, in overlap area, to the slip surface at the base of the slide.

Composition of Slide: Fill material consisting of clay-to-cobble size particles of serpentine and altered igneous rock.

Surface Features: 1. Prominent slip-face escarpment at head and shear escarpment on left flank.

2. Slickensides on shear face on left flank indicating pressure of slide against that point.

3. Tension cracks, up to 3 feet in width and 50 feet in length—not prominent in upper half.

4. Ground water seepage at toe of slide and on left flank.

5. Pressure and flow ridges in mid-section (overlap area) and toe (deposition area).

6. Mud ooze at the head, left flank, and toe.

Damage to Structure:

1. A concrete, steel-reinforced boat ramp on the head of the slide has been highly warped and cracked. The ramp is 50 x 75 feet and consists of the beam and bay type of design. The concrete is 2 feet thick in the beams and 8 inches thick in the bays.

2. The asphalt road at the head of the boat ramp has been broken and contorted.

3. A small amusement stand & slab, a gas pump, and a storage tank, have been severely damaged.

4. Sloughing back of the slip face is threatening to damage a motor, pump, and well column.

5. If the slide continues, fill spillage into the reservoir could damage or clog the inlet structure.

S. C. V. W. C. D.
MICROFILMED – JANUARY 1969
PG. 1 OF 2

115-41

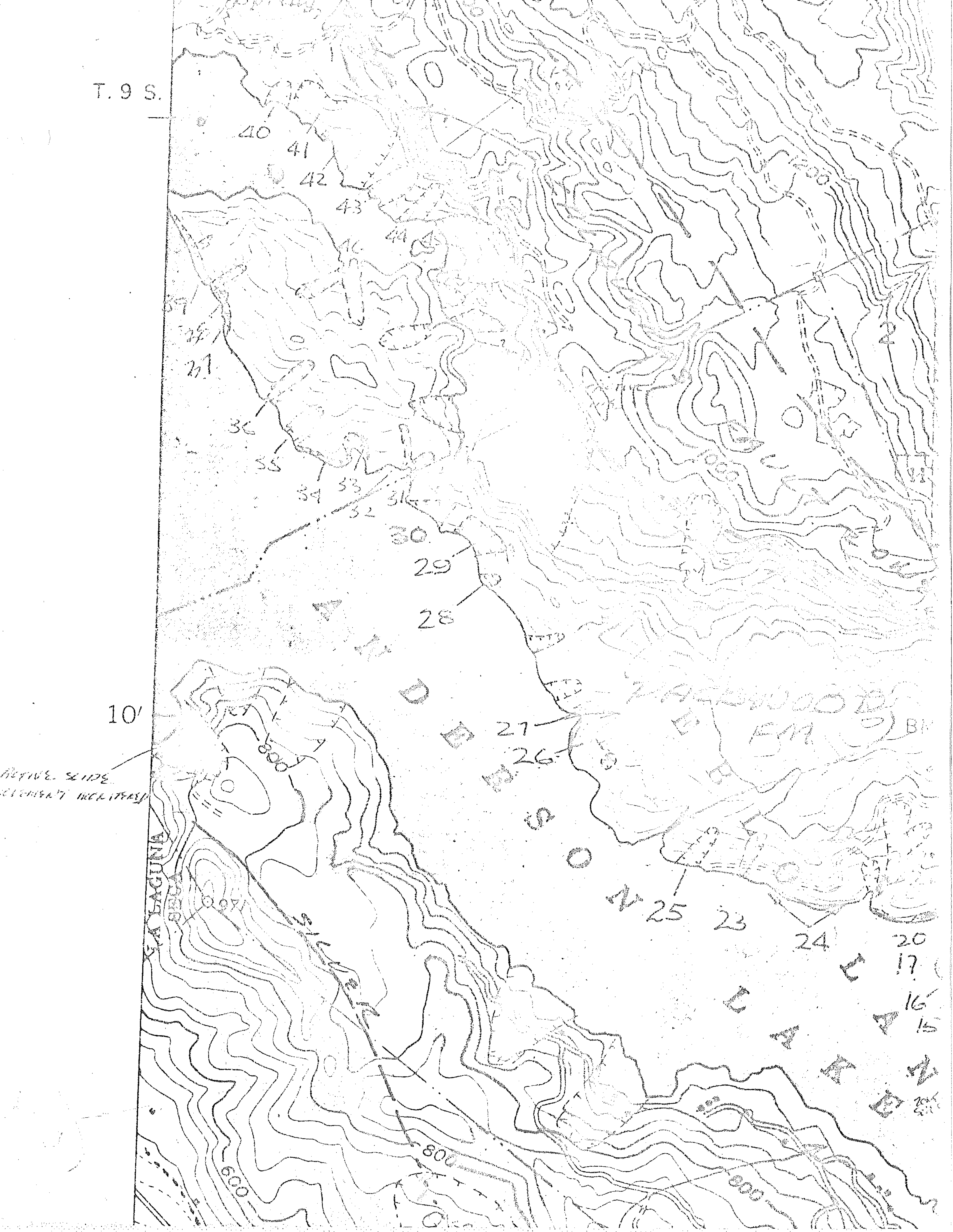
Causes of the Slide: The rains of February-March, 1962 undoubtedly supplied extra load to the fill and lubrication to the base of the fill. In addition, a heavy boat ramp was constructed on the fill last year. The position of the boat ramp in relationship to the movement of the slide suggests that the weight of the ramp may have triggered the fill material, the shear strength of which had already been greatly lowered by ground water.

Prevention of Further Damage:

1. The heavy concrete ramp at the head of the slide should be removed as soon as possible.
2. The slide should be surveyed and stake lines should be plotted across it so that the rate and direction of movement can be determined.
3. An arc-shaped berm should be constructed around the head of the slide to keep out possible storm run-off.
4. The downward movement of the slide is being slowed by a resistant formation of flat-lying terrace gravels. Of course, these terrace gravels must not be removed. An arm of the slide is moving to the dam side of these gravels and is spilling out on a haulage road. This material should probably be removed before it overloads the fill directly above the inlet structure.
5. It may be feasible to drive some type of drainage pipe into the left flank of the slide and tap off some of the ground water.

cc: John H. Clarke, Hydrographic Engineer
Dan Kriege, Asst. " "

S. C. V. W. C. D.
MICROFILMED – JANUARY 1969
PG. 2 OF 2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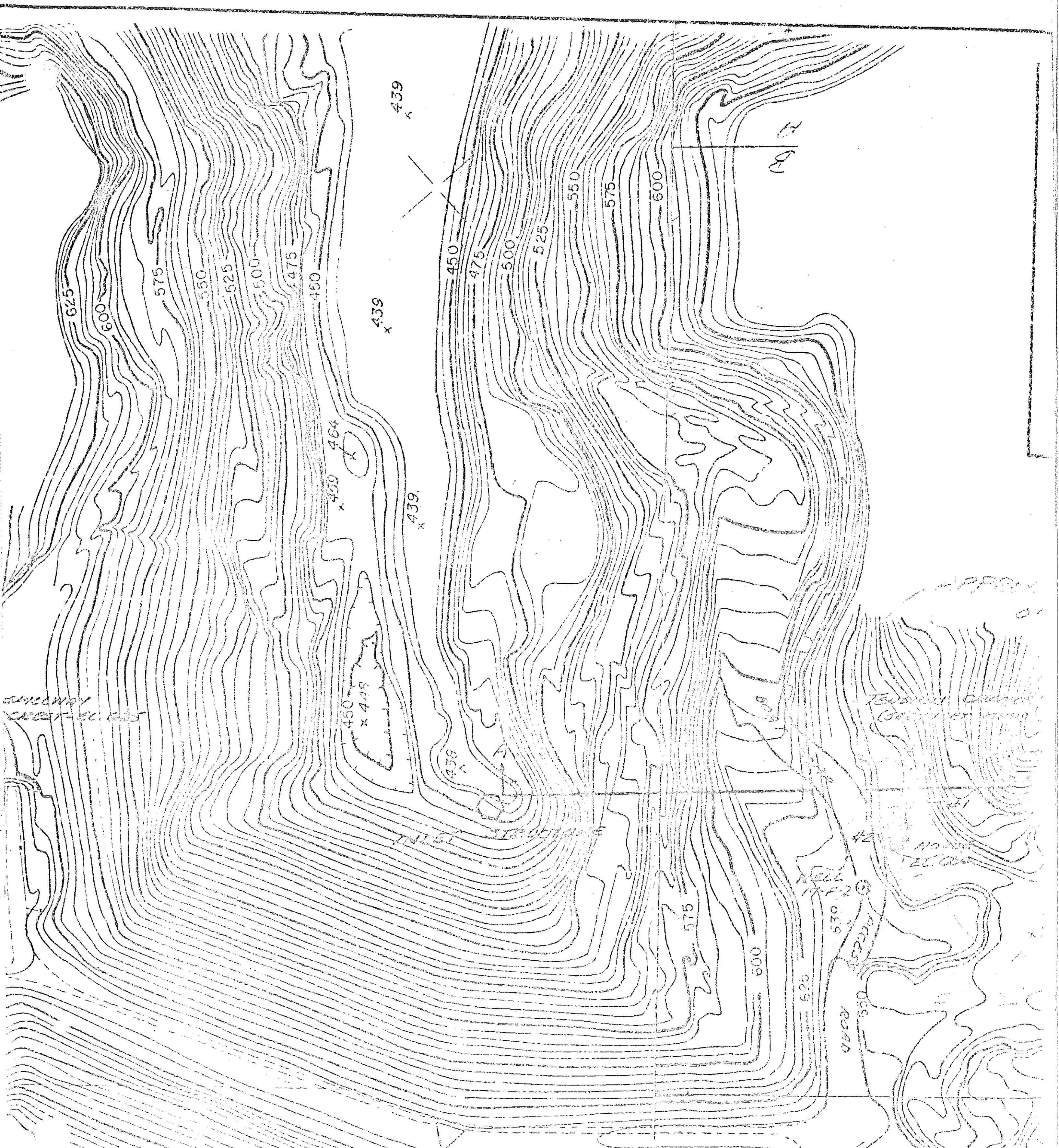
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INLET STRUCTURE
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TUNNEL GRADIENT
#1
#2
WELL
17-F2
ACCESS
ROAD
DATED JUNE 1961

STATE OF CALIFORNIA
Department of Public Works
SACRAMENTO

ADDRESS REPLY TO
DIVISION OF WATER RESOURCES
P. O. BOX 1079
SACRAMENTO 5
PUBLIC WORKS BUILDING
1120 N STREET

May 8, 1956

COPY

Board of Directors
Santa Clara Valley Water Conservation District
90 North Second Street
San Jose, California

Subject: Santa Clara Valley Water
Conservation District Dams
File No. 72-0

Gentlemen:

It is understood that your District is currently planning a program of new construction to be financed by a bond issue. We desire to invite your attention to the fact that maintenance of your existing works will require increasing attention in the future as the structures become older and to request the immediate budgeting of funds for certain items of maintenance on the dams which have been deferred for some time past and which are urgently required to protect the public safety and welfare, as well as the dams themselves. Listed briefly below are maintenance items which this office believes must receive immediate attention.

Leroy Anderson Dam, No. 72-9

When this reservoir is full, excessive leakage occurs through the right abutment. This leakage saturates a large area to the left of the spillway channel, producing large hydrostatic pressures on the left spillway wall as well as uplift on the spillway slab. A method of draining this area so as to relieve these pressures has been suggested to Chief Engineer Robert Roll and he has been requested on several occasions to provide this drainage. The proposed work would also be of value in improving the appearance of the spillway area and relieving any public concern caused by the visual evidence of the heavy seepage.

S. C. V. W. C. D.
1956
3

STATE OF CALIFORNIA
Department of Water Resources
SACRAMENTO

June 10, 1958

Mr. J. Robert Roll, Chief Engineer
Santa Clara Valley Water Conservation District
1520 Almaden Road
San Jose, California

Subject: Santa Clara Valley Water
Conservation District Dams
File No. 72-0

Dear Mr. Roll:

This is in confirmation of the conclusions reached, relative to various items of maintenance work at several of your dams, during the inspections and conference with Mr. Clevinger and Mr. Keysor on May 28, 1958.

install a drain

1. At Anderson Dam it is understood that you will install a drain in the saturated area between the right abutment and the spillway. This drain, to consist of 6" or 8" drain tile in a trench some five or six feet deep, partially backfilled with gravel, will extend from near the upstream end of the spillway, [illegible] along the toe of the steep escarpment, and will discharge into the spillway channel somewhere near Station 7+00. It is understood that this will be done within a month or [illegible].

Coyote

4-17-27

2. At Coyote Dam it is understood that you will make immediate repair of the recently failed floor slab at the downstream end of the spillway chute, at its junction with the terminal wall; and that you propose a major repair of spillway floor slabs, to be effected next year. The latter will require considerable design, and drawings and a repair application will be presented to this office for approval.

Most of the slide material upstream of the spillway weir has been eroded away by heavy spillway flows in 1956 and this year. The remnant can readily be removed with a bulldozer, however, and it no longer appears that its removal will induce more sliding.

S. C. V. W. C. D.
MICROFILMED - JANUARY
Pd.

memorandum

TO John Richardson

FROM Daniel F. Kriege

SUBJECT Anderson Lake Ramp Repair Work

DATE November 21, 1972

The proposed development by the County at Anderson Dam to improve the access to the boat launching ramp appears to be reasonable subject to an adequate soil investigation prior to any excavation of material. The proposed road is in an area of potential slide and an excavation could cause a slide.

Therefore, it is recommended that a soil investigation and a proper design, especially the problems of drainage, be adequately considered before final approval is given for this request.

Daniel F K

Head, Operations Branch

DFK:vlm

Zoe

see if you can get this file

John

R Esau has file
Peg is checking

Z 3:30
1/17

	Init	'72	Code
CURRLIN			
ENANDER			
ESAU			
FOWLER			
GARRETT			
HENLEY			
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ACTION CODES
. RUSH
. CONTACT ME
. FOLLOW-UP
. COMMENT
. ACTION
. INFORMATION
. RETURN
. FILE
. APPROVAL
. DUE DATE:

REMARKS: Copy - R.A.

please review. Under terms of our lease, do we need to issue a formal Permit?

ORIGINAL LETTER IS IN CENTRAL FILES. PLEASE RETURN THIS COPY TO CENTRAL FILES ONLY IF THERE ARE ENCLOSURES OR ATTACHMENTS.

TO	Flood Control & Water Dist. George Korbay	FROM	RICHARD SIMONS, Park Planner Parks and Recreation
SUBJECT	Anderson Lake Ramp-Use of Slope.	DATE	November 1, 1972

This department is currently studying the redesign of the parking area serving the launch ramp at Anderson Lake. To make the most efficient use of the area, a one-way traffic lane connecting the ramp and the parking lot would relieve much of the confusion that always develops between incoming and outgoing traffic.

I anticipate a grade of approximately 8% on this road over the 150' length planned. If room permits, we would also be installing a comfort station at the toe of the slope.

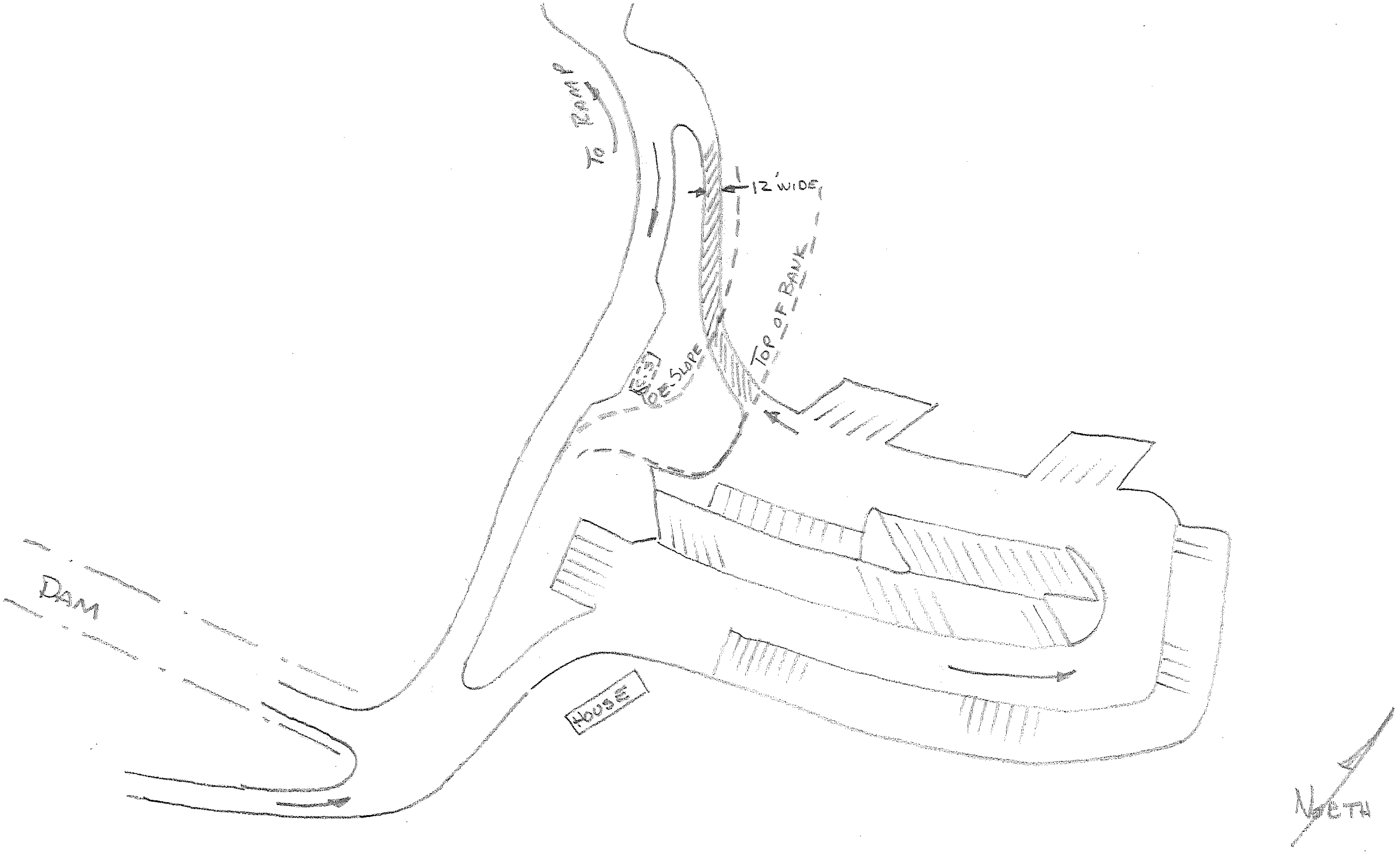
Would you review the proposed road location, indicated on the attached map, for its suitability in light of the soil conditions in the area.

Richard E Simons

'72 NOV 2 AM 9:35
S.C.C.F.C. & W.D.

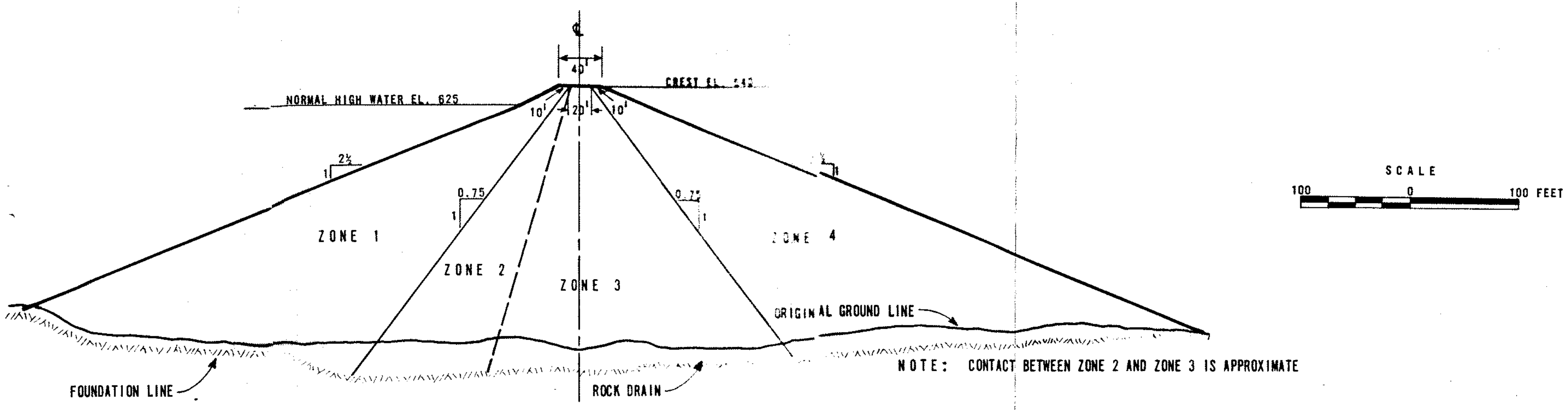
RES:amf
Attachment

REORDER CODE NO. 963077
28 Rev 10-64



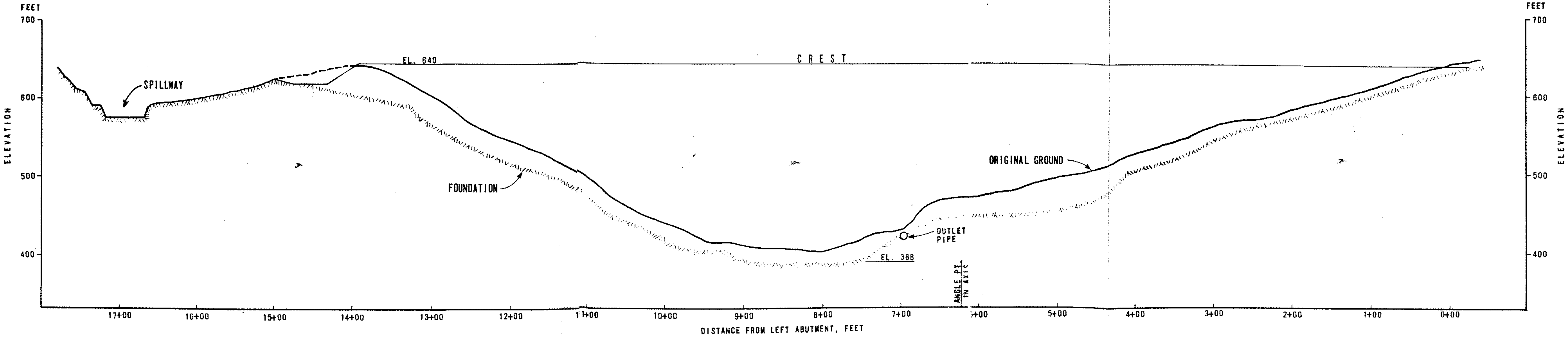
ANDERSON LAKE-RAMP AREA

11-1-72
R. SIMONS



NOTE: CONTACT BETWEEN ZONE 2 AND ZONE 3 IS APPROXIMATE

MAXIMUM SECTION STATION 3800



DEVELOPED PROFILE ALONG AXIS

W. A. WAHLER & ASSOCIATES	ANDERSON DAM	MAXIMUM CROSS SECTION AND DEVELOPED PROFILE		
	PALO ALTO • NEWPORT BEACH • CALIF.	PROJECT NO 0746A	DATE SEPTEMBER 1976	DRAWING NO V-1

Jack Watkins, Jr.　　　　　　　　　　Daniel F. Kriege

Slide at Anderson Dam　　　　　　　　　January 21, 1970

I noticed in the Read File a memorandum from Leo Page to Bill Roman dated January 6, 1970 relative to the landslides upstream of the left abutment of Anderson Dam. As you may recall, early last spring a potential slide caused the abandonment and ultimate relocation of the house that we have at Anderson Dam. The potential problem of slides in the area still exists and it appears that the situation may be critical. I have discussed this problem briefly with Mr. Page and it is my recommendation that we should install several permanent concrete markers that could be utilized to determine the slide movement and, as recommended by Mr. Page, that we monitor these markers bi-monthly or, if the case warrants, oftener.

We have recently conducted a survey of the water in the reservoir to determine why the outflow of the reservoir is, at times, high in turbidity without any apparent turbid inflow. My first suspicion is that there is some sliding and/or ravelling of material below the water surface. The results of this study should be available momentarily and might shed some light on the problem.

It is my recommendation that we meet with Mr. Page and others concerned with this problem and set up the program for investigation and monitoring of this potential dangerous situation. I do not know whether we can afford the luxury of waiting until next year to budget the necessary funds to investigate this problem.

DFK

Daniel F. Kriege
Division Engineer
Water Operations Division

DFK:rn

cc: Leo Page ✓

1-8-70

ANDERSON

STAKES	C-C'	3.30
	B-B'	4.60

1-9-70

Called Kriege

he says stakes were moved

" " measurements were recorded before stakes moved

Called Jack Burns
informed him of Discussion with Kriege

12-24-69
LMP

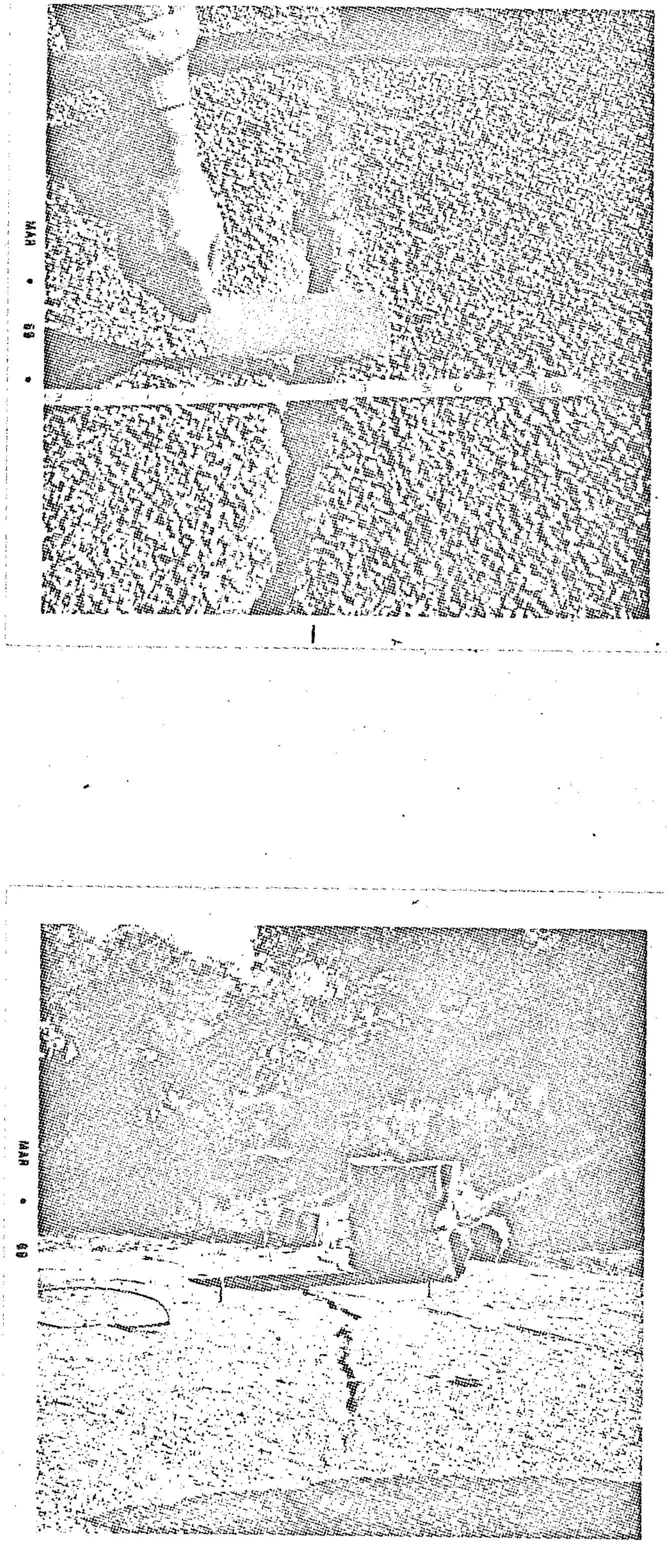
DISCUSSED WITH W. SORENSON
VISIT BY STATE DAM
INSPECTOR * TO ANDERSON DAM

* JACK BURNS
916
445-1520

1130

Measured distance between stakes

		3-17-67	STATE MEAS
A-A' = 3' 10.8"	= 3.90'	3.87	3.88
B-B' = 4' 7.4"	= 4.62'	"	4.60"
C-C' = 3' 3.7"	= 3.31'	"	3.30"

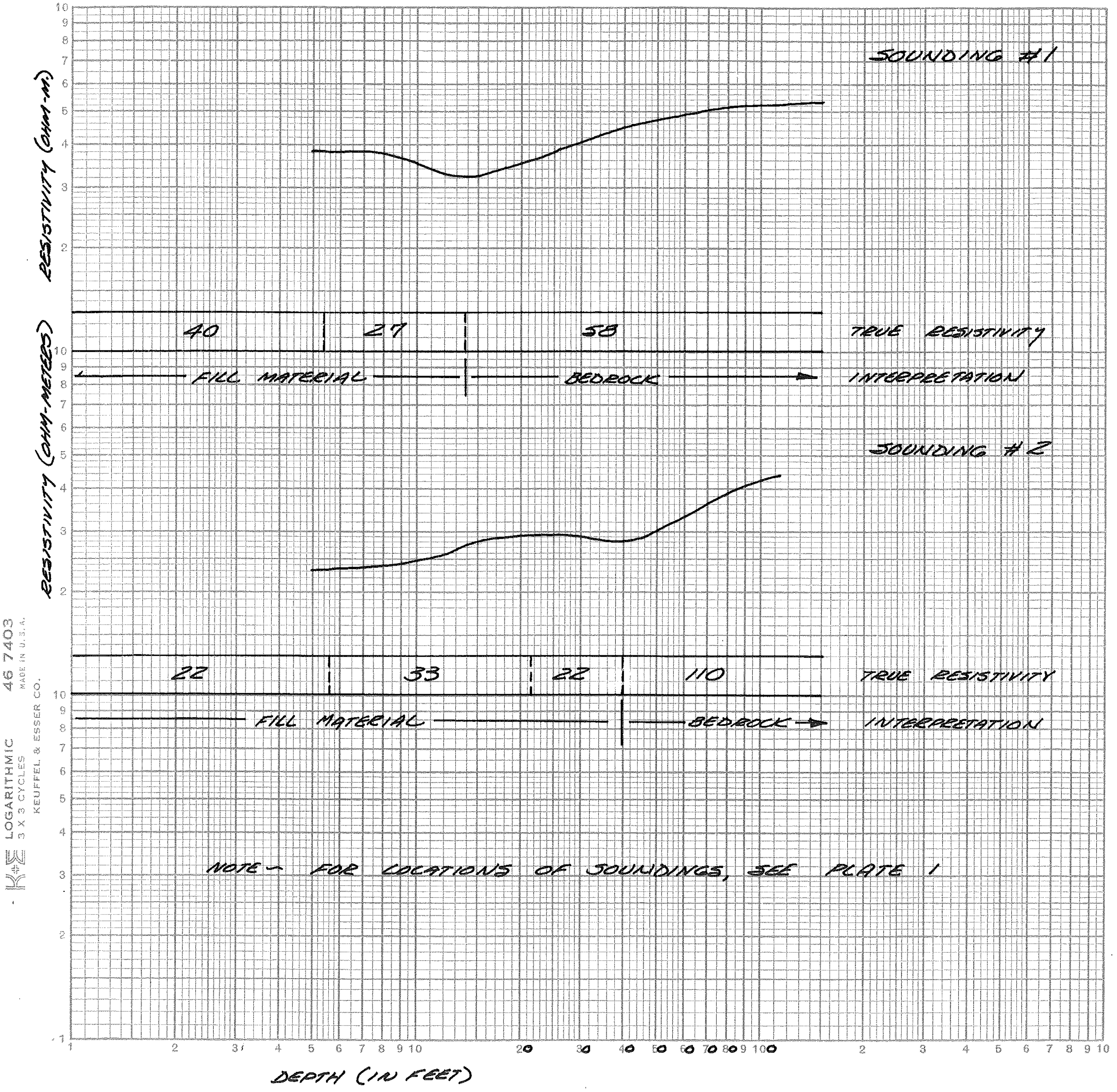


TENSION CRACKS AT POTENTIAL SLOPE FAILURE

ANDERSON RESERVOIR (LOOKING NORTHEAST)

3-19-69

PLATE 4



CURVES OF RESISTIVITY SOUNDINGS
POTENTIAL SLOPE FAILURE
ANDERSON RESERVOIR

3-19-69

PLATE 6

Mr. W. Roman via
Mr. C. Church

J. Wire

March 26, 1969

Geologic Conditions at the Landslide Upstream of the South Abutment of Anderson Dam

REFERENCES

1. Geological Report on Anderson Dam site, located across Coyote Creek in Santa Clara County, California by Chester Marliave (9-15-49).

2. Photograph Album - Pictures taken during construction of dam, by Jack Clarke.

3. Memo - "New Landslide at Anderson Reservoir", March 19, 1962, by E. Imhoff to J. R. Roll.

4. Well log - Well 7-F-Z.

General

On February 28, tension cracks up to 1/2-inch wide in a zone 20 to 30 feet long were first noticed in the driveway north of the caretaker's home near but upstream of the south abutment of Anderson Dam (See attached map). On this date the reservoir was spilling, with the water surface elevation at 627.03 feet, 2.02 feet above spillway crest. The zone of cracking is just northwest of the break in slope between probable fill and bedrock. Three pairs of stakes were placed on opposite sides of the zone of cracking, to measure the horizontal displacement. By March 3, the zone of cracking extended to a length of 70 feet. Until March 11, the potential slide mass was moving at the rate of 0.01 foot/day, but since that date, no further horizontal movement has occurred. Total vertical displacement as of March 17 is 1/2 inch.

Field and office work completed to date and reported in this memo has been oriented toward understanding geologic conditions causing the slide, and initiating further field studies required for monitoring movement and recommending remedial work.

The following exhibits accompany this memo:

1. Plan of dam and adjacent reservoir (Scale 1 inch = 200 feet) Plate 1

2. Horizontal movement between stakes along potential slope failure - Plate 2.

3. Geologic cross section in vicinity of potential slope failure - Plate 3.

4. Photos of crack looking northeast, taken 3-19-69 - Plate 4.

5. Print of drillers log for well 17-F-2 - Plate 5.

6. Curves of resistivity soundings - Plate 6.

Discussion

Based on a study of available data, including an analysis of a previous landslide in the same general area (see references), plus construction of a geologic section based in part on resistivity data, it appears as though most of the slide mass is composed of residual soil and fill (clay and angular rock fragments) which was placed as a part of the haul road system during construction. Two resistivity soundings made on March 19 at locations shown on Plate 1, using the Schlumberger electrode configuration, indicate a thickness of fill (on top of bedrock) ranging from 15 feet behind the house to 40 feet closer to the reservoir. This material, as well as the adjacent fractured rock has become saturated as a result of the high reservoir level and percolation of rainfall during the past month. The high hydrostatic head within the mass is indicated by flowing water from the top of casing at elevation 640, in well 17-F-2 located about 100 feet south of the slide and shown on the enclosed map.

As shown on the geologic section with this memo, the mass of fill is inferred as nowhere greater than about 40 feet thick, resting on either older alluvium or bedrock. The thickness of fill is generally substantiated by resistivity soundings, which show that the fill is about 15 feet thick in the vicinity of the cracking, thickening to about 40 feet west of the house. The log of nearby well 17-F-2 indicates a depth of 60 feet to bedrock.

The potential slide block had been moving since March 1 at the rate of 0.01 feet/day; however, measurements made since March 12 indicate no further movement, probably owing to a dissipation of hydrostatic head during a period of no rainfall and allowing the nearby well to flow unrestricted.

No further cracking has been detected, after examining the face and sides of the potential slide mass. Based on available information on the extent and depth of slippage, the potential slide mass contains about 10,000 cubic yards of material.

RECOMMENDATIONS

Further field investigations and surveillance measures are recommended as follows:

1. Bench marks should be set out from stable bedrock into slide mass and foundation area of the house so that periodic leveling will detect further vertical movement.

2. As the reservoir level is lowered, the face of the slope should be inspected for signs of potential instability, particularly since the drawdown condition is most critical to slope stability.

3. The well casing should be opened at the lowest possible elevation to provide continuous gravity relief to as low an elevation as possible.

The scope of remedial work will partly depend on the thickness and extent of the potential slide mass as determined by the field investigations outlined above. At the present time, the following alternatives should be considered:

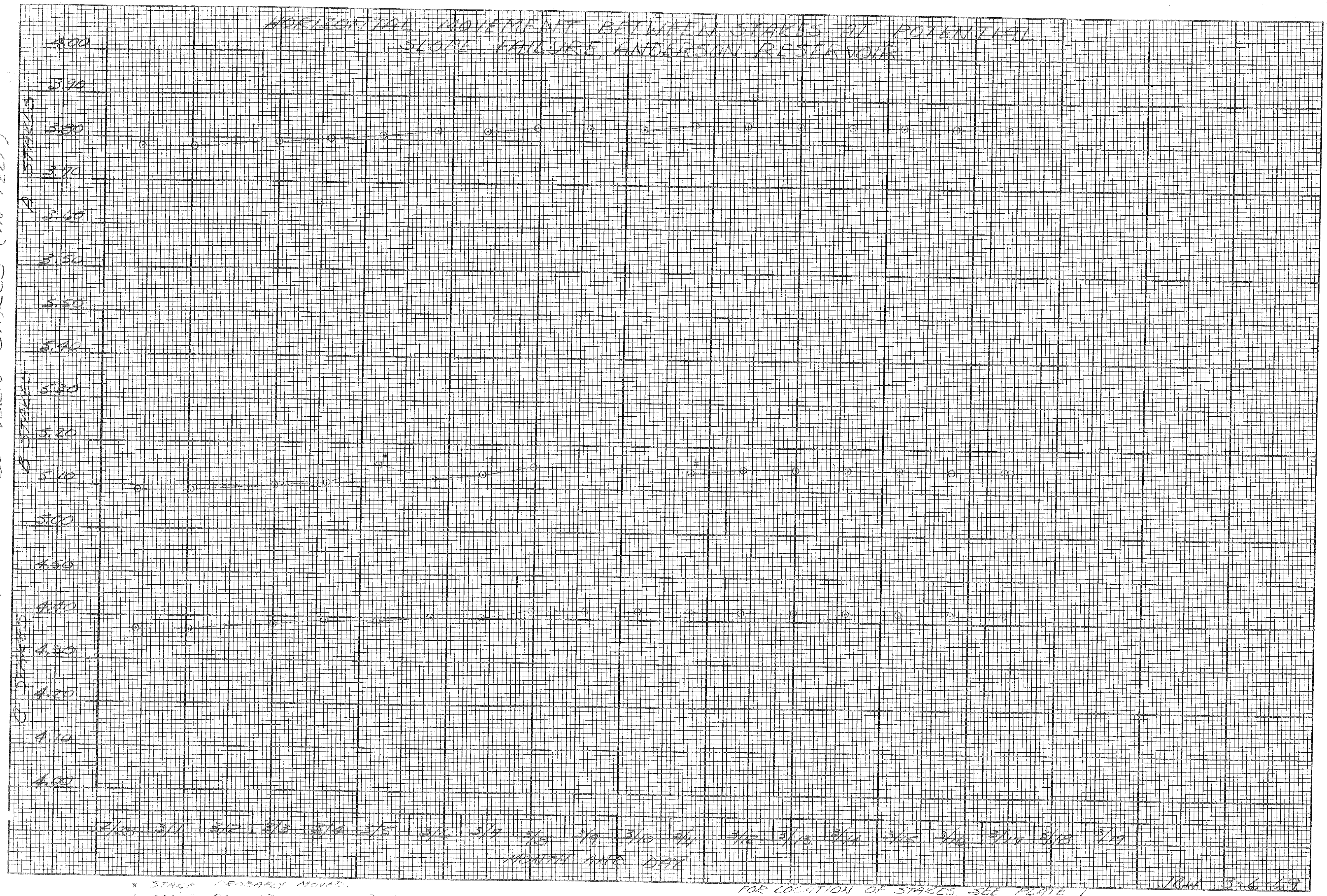
1. The house should be removed, and fill material stripped to an average depth of 5 feet within the area shown on Plate 1 (roughly between the 655 and 665 foot contours.) About 2,000 cubic yard would be excavated.

2. If the slide proves to be confined to the shallow fill above the present reservoir level, then perhaps horizontal drain-collector pipes could be installed which would effectively "bleed" off the hydrostatic pressure and prevent further sliding.

3. If the slide proves to be more deeply seated, at a depth below the present water surface in the reservoir, then unloading the top of the slide mass by removing the house plus the fill down to the level of the boat ramp access road would be the first step to take in preventing further sliding.

Jerry C. Wise
Engineering Geologist

LCF:JW:mm



* STAKE PROBABLY MOVED.

‡ STAKE REMOVED; REPLACED 3-11.

FOR LOCATION OF STAKES, SEE PLATE 1

PLATE 2

CLEARPRINT PAPER CO. NO. C48. 20 DIVISIONS PER INCH BOTH WAYS, 300 BY 200 DIVISIONS.

CLEARPRINT CHARTS ®

PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015

Jack Watkins, Jr. Daniel F. Kriege

Slide at Anderson Dam January 21, 1970

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DFK

Daniel F. Kriege
Division Engineer
Water Operations Division

DFK:nn

cc: Leo Page ✓

SANTA CLARA VALLEY WATER CONSERVATION DISTRICT

Well No. 7-F-2, **Owner :** S.C. Water Cons. District **Date drilled** 7-53

Address:

DRILLERS LOG BY F. W. PORTER DRILLER

depth 1st H_2O = 40'
depth H_2O before perf = 25'
depth H_2O after perf = 25'

100' of 10" casing
55' of 8" casing

0		5	Clay and rock = loose
5		30	Clay and gravel = 2" - tight - yellow
30		45	Gravel and sand 3/4" medium
45		60	Gravel and clay 3/4" yellow - tight
60	15	75	Rock - serpentine - hard
75	20	95	Shale - blue - medium
95	10	105	Rock - serpentine = hard
105	40	145	Shale - blue hard
145		150	Rock - serpentine - hard

perf: 25' to 100'
300 holes 1/4" x 4"

perf: 106' to 150'
150 holes 1/4" x 4"

ORIGINAL DEPTH 150'

10" CASING — 6" COLUMN WITH SANITARY SEAL

DEPTH CHECKED BY PIONEER PUMP WHILE BORING STILL THERE - 135'

Ref.
5250 ft
8
1"=100'

"Geologic Rept. on Anderson Dam Site [illegible] Coyote Cr. in SC Co, Calif by C. [illegible], Sept. 1949.

[illegible]

[illegible] to be investigated - [illegible]

1. [illegible] thickness of [illegible] by [illegible]

2. [illegible]

3. [illegible]

(See item 5.)

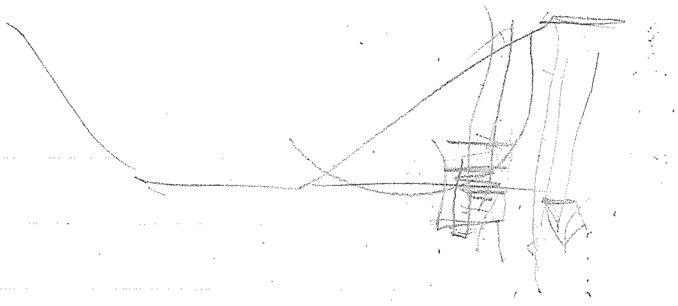
4. Note possibility that old alluvium could extend to elev. of 425 or greater as per C.B. [illegible] letter dtd. June 8, 1950.

5. Possible remedial work: (incl. in [illegible])

(a) - drain pipes.

(b) - remove fill down to [illegible] boat launching road. As reservoir drains, check stability of material exposed, down to Elev. 550±

c. Program for mapping next F.Y. to include ~~review~~ review of slope stability of landslide masses around periphery of reservoir, and consider measures for stabilizing same.

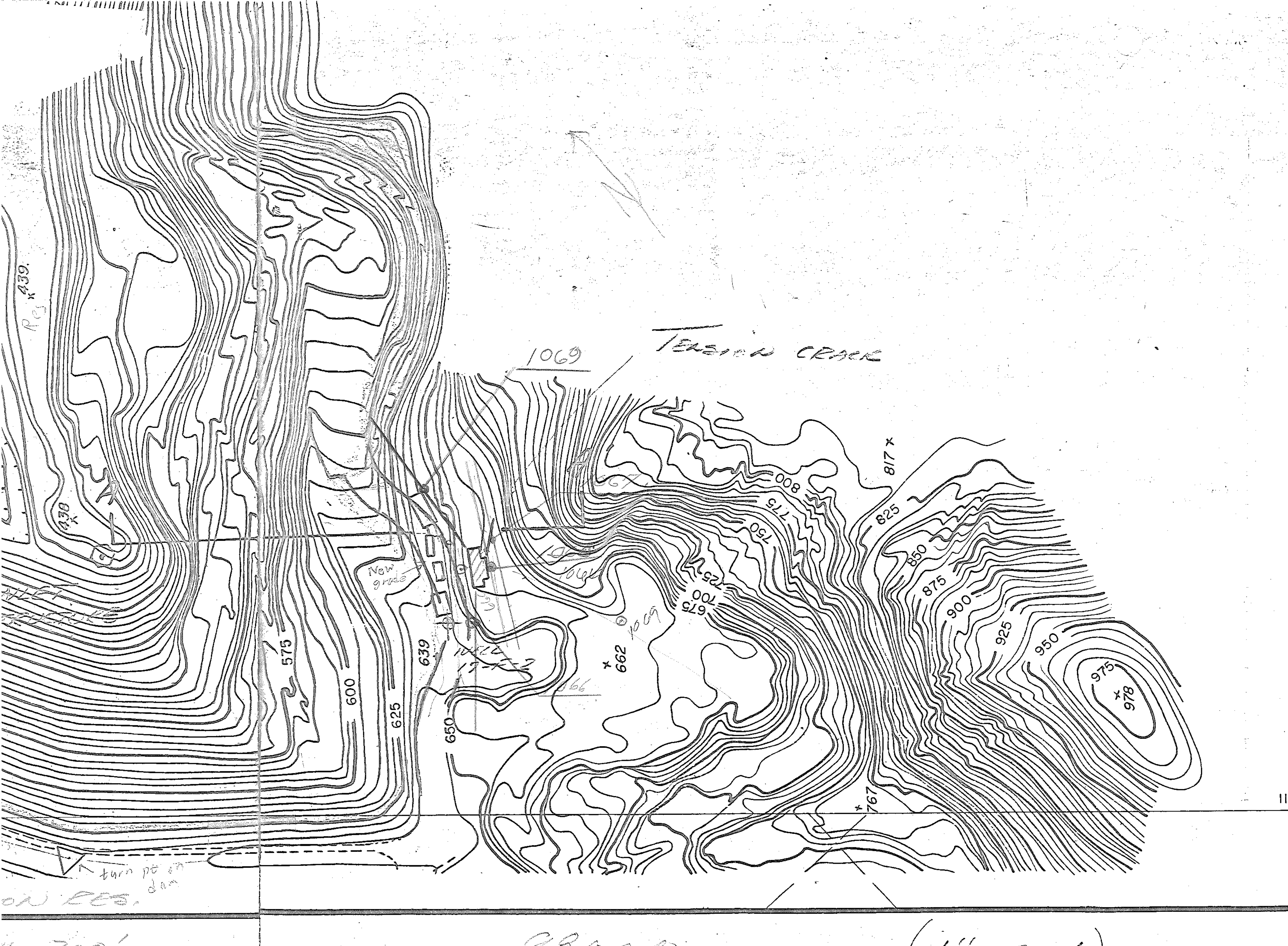


Operations
for [67-68]

Raw Water
T&D Cost Ch. → 175,737
5 #5 → 3,537

if req'd. CWTP — 301,709
if req'd. U.P. Line — 15,464

496,

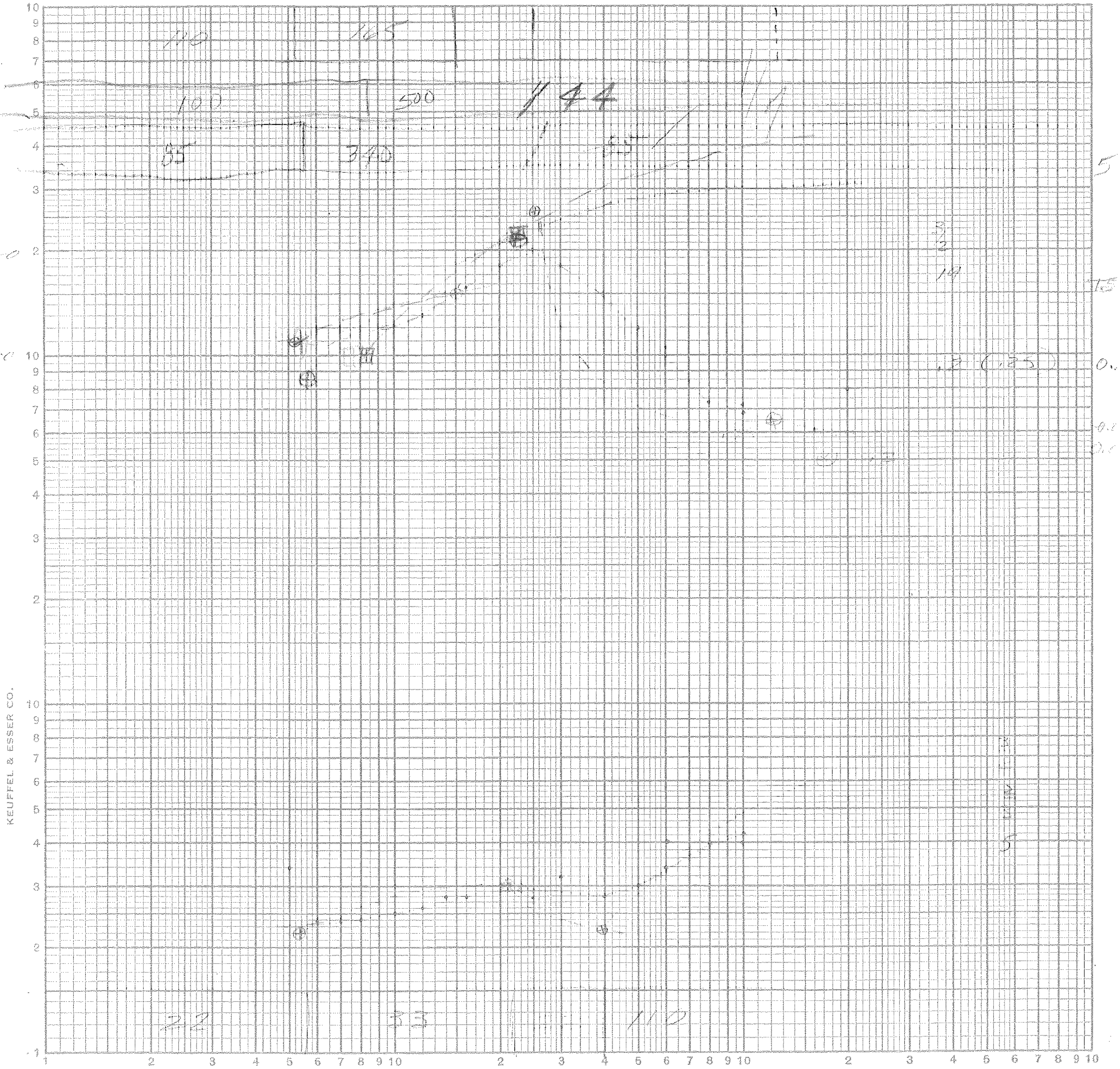


= 200'

98000
LOWER [illegible]

(1" = 200')

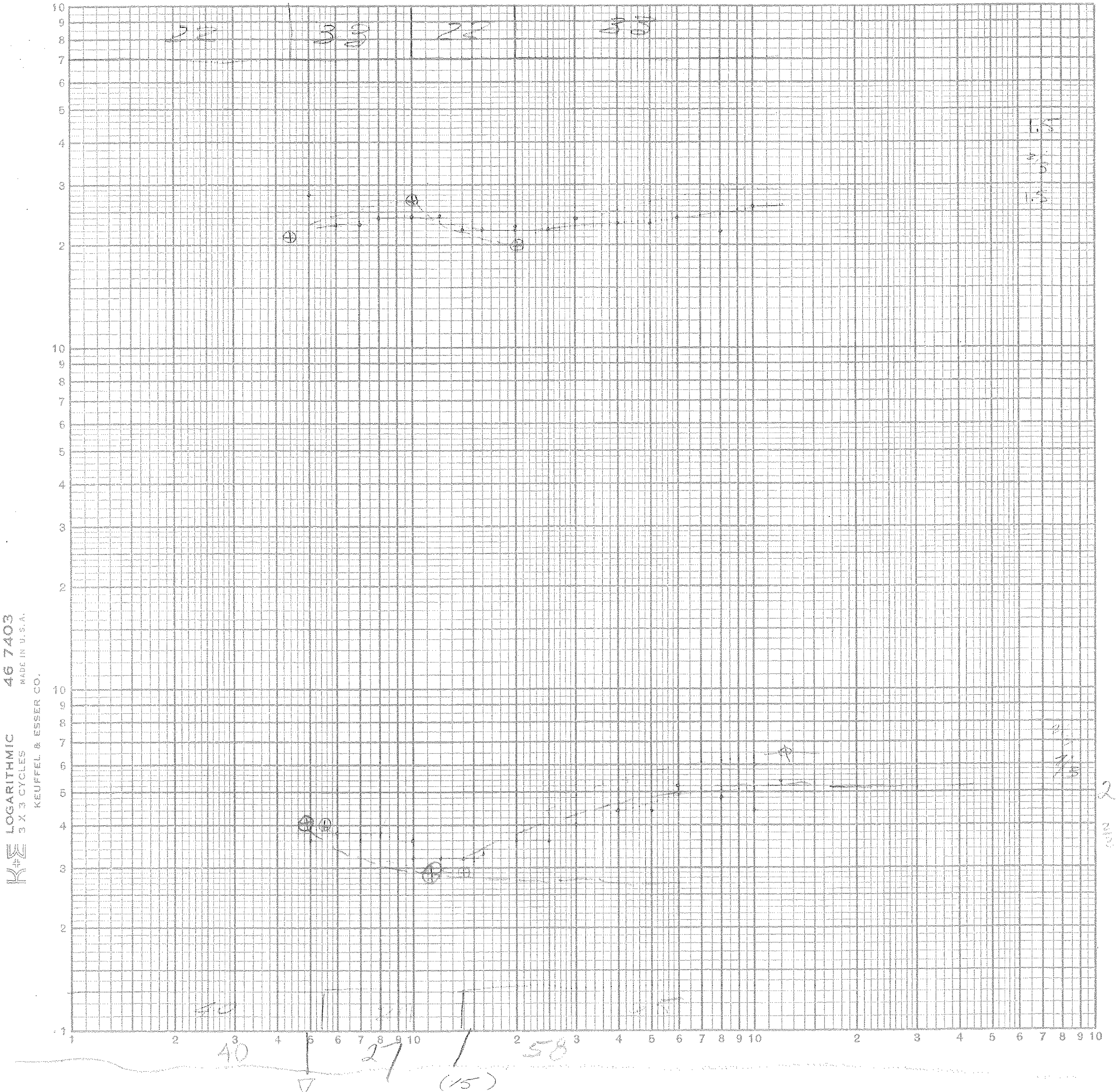
Sta 1064 - Huerfano - [illegible] Peak (Rock



K+E LOGARITHMIC 46 7403
3 X 3 CYCLES MADE IN U.S.A.
KEUFFEL & ESSER CO.

Sta. 1066 Huerfano Co.

STA. 1067



STA. 1066 - ANDERSON RD.

~~References: Dam fill practices + rotations~~
~~irrigation flow~~

~~1. Bull. 42. p. 39.~~

Mar-19: Anderson.

Resistivity → Blocs.

in back, front of house at midpt.
across st. from well, and
at face of quarry.

Note vert. displ. to 1/2" on east end of crack.

Note seepage running 1/4 gpm est. on east
@ toe of slope - jct. w/ boat ramp.

Well is flowing, 2-3 gpm.

memorandum

TO

FROM

SUBJECT Separation of Markers

DATE

Along Tension Crack @ Anderson

2-28 1730 hrs

A = 3.78'
B = 5.09'
C = 4.37

3-1 16:30 hrs.

A = 3.78
B = 5.09'
C = 4.37

3-3 0800 hrs.

A = 3.79'
B = 5.10'
C = 4.38'

3-4 0800 hrs.

A = 3.80'
B = 5.11'
C = 4.39'

3-5 0800 hrs.

A = 3.81
B = 5.15*
C = 3.39

3-6 0910 hrs.

A = 3.82
B = 5.12
C = 4.40

* Disturbed?

3-7 0815

A = 3.82
B = 5.13
C = 4.40

3-8 0730

A = 3.83
B = 5.15
C = 4.42

3-9 0700

A = 3.83
B = ——— *Removed stake.
C = 4.42

3-10 0810

A = 3.83
B = ———
C = 4.42

3-11 0800

A = 3.84
B = 5.14 - Replaced stake
C = 4.42

3-12 8$^{\underline{00}}$

A = 3.84
B = 5.15
C = 4.42

3-13 A = 384 8$^{\underline{00}}$
B = 5'15
C = 442

Rev. 6-67

Settlement of Markers
Along Tenson Creek @ Anderson.

3-14 A: 3.94 8am
B = 5.15
C = 4.42

3-15 Same 8am

3-16 Same 8am

3-17 Same 8am

Res. stage @ Anderson.

Feb. 2/17	620.33'
18	621.39
19	622.28
20	623.24
21	623.84
22	624.41
23	625.11
24	626.31
25	628.05
26	627.77
27	627.77
2/28	627.02
Mar. 1	626.96
2.	626.83
3.	626.48
4.	626.21
5.	626.03
6.	625.70
Mar. 7	625.62
8	625.75
9	625.73
10	625.78
11	625.76
12	625.55
13	625.60
14	625.63
15	———
16.	625.16
17	624.96

[illegible]

Anderson Dam
Slide on South abutment

Date	time	A	B	C
2-28-69	1730	3.78	5.09	4.37
3-1-69	0001	3.78	5.09	4.37
3-1-69	0200	"	"	"
3-1-69	0400	"	"	"
3-1-69	0600	"	"	"
3-1-69	1100	"	"	"
3-1-69	1500	"	"	"
3-1-69	1630	"	"	"
3-3-69	0800	3.79	5.10	4~~3~~.38
3-4-69	0800	3.80	5.11	4~~3~~.39
3-5-69	0800	3.81	5.15*	4~~3~~.39
3-6-69	0910	3.82	5.12	4.40
3-7-69	0815	3.82	5.13	4.40

* marker had been moved - appeared to have been kicked

santa clara county

FLOOD CONTROL AND WATER DISTRICT

DONALD K. CURRLIN GENERAL MANAGER

516 EAST MARTHA STREET
SAN JOSE, CALIF. 95112
DEPARTMENT OF ADMINISTRATION AND FINANCE 299-2031
CLERK OF THE BOARD 299-2031
ENGINEERING DEPT. 299-3841
PUBLIC SERVICE DEPT. 299-3841

March 26, 1969

Mr. Clifford Cortright
Division Engineer
Division of Safety of Dams
Department of Water Resources
Post Office Box 388
Sacramento, California

/Cortright.

Dear Mr. Cortwright:

Enclosed for your information is a copy of a memorandum by our staff Engineering Geologist reporting on a potential slide at Anderson Reservoir. A crack in a bench upstream of the south abutment of the dam was observed by our Resident Caretaker on 28 February 1969. Upon notification the site was immediately visited and inspection revealed no likelyhood of danger to the dam structure. However, a large slide could have an adverse effect on the intake structure for the outlet works through the dam or could cause wave action in the reservoir if it occurred suddenly.

Measurements were taken of the width of the crack and a surveillance program was established to assess the magnitude of the problem. A well in the vicinity of the potential slide area was uncapped and allowed to flow free in order to help reduce the water pressure in the soil mass. The Caretaker was evacuated from the house on the bench even though it appeared that the mass was slowly stablizing.

As indicated by the enclosed memorandum the movement of the soil mass has apparently stopped. Nevertheless, we are having the house moved off the bench and will excavate a considerable portion of the potential slide mass in an attempt to releave the load and stabilize the slope. After the excavation has been completed we will review the situation to see if further stabilization measures may be desirable.

We will notify you of any further action and results obtained in this matter.

Sincerely yours,

Lloyd C Fowler

Lloyd C. Fowler
Director of Engineering

Enclosures

memorandum

TO W. Roman via C. Church FROM J. WIRE

SUBJECT GEOLOGIC CONDITIONS AT THE LANDSLIDE ON THE SOUTH ABUTMENT, ANDERSON DAM. DATE 3-11-69

REFERENCES:

1. Geological Report on Anderson Dam Site, Located across Coyote Creek in Santa Clara County, Calif. by Chester Marliave (9-15-49)
2. Photograph Album - Pictures taken during construction of dam. by Jack Clarke
3. Memo - "New Landslide at Anderson Reservoir" - March 19, 1962; by E. Imhoff to J. L. Bell.

GENERAL

On Feb. 28, tension cracks up to ½-inch wide in a zone 20-30 ft. long appeared in the driveway south of the caretaker's home near the dam at Anderson Reservoir (see attached map). The zone of cracking is just northwest of the break in slope between probable fill and bedrock. Three pairs of stakes were placed on opposite sides of the zone of cracking, to measure the horizontal displacement. Currently, the potential slide mass is moving at the rate of 0.01 ft./day.

By Monday, March 3, the zone of cracking memorandum

TO FROM

SUBJECT DATE 3-11-69

extended for a length of 70 ft. Field and office work completed to date and reported in this memo has been oriented toward understanding geologic conditions causing the slide, and initiating further field studies required for monitoring movement and recommending remedial work.

The following exhibits accompany this memo:

1. Plan of dam and adjacent reservoir (scale 1"=200')
2. Plot of separation between stakes along potential slope failure.
3. Geologic cross section in vicinity of potential slope failure.

Discussion

Based on a study of available data, including an analysis of a previous landslide in the same general area (Reference) plus construction of a geologic section, it appears as though most of the slide mass is composed of residual soil and fill which was placed as a part of the haul road system during construction.

memorandum

TO FROM

SUBJECT DATE

This material, as well as the adjacent fractured rock has become saturated as a result of the high reservoir level and percolation of rainfall during the past month. The high hydrostatic head within the mass is indicated by flowing water from the top of casing at elev. 640, in well 17-F-2 located about 100 ft. south of the slide.

As shown on the geologic section with this memo, the mass of fill is inferred as nowhere greater than about 30 ft. thick, resting on either older alluvium or bedrock. The thickness of fill should be substantiated by resistivity soundings as detailed in a subsequent paragraph.

The potential slide block has been moving since March 1 at the rate of 0.01 ft./day; however, measurements made on 3/9 indicate a cessation of movement on stakes A and C. The movement may be slowing down or stopping altogether, owing to a dissapation of hydrostatic head during the period of no rainfall last week and allowing the nearby well to flow unrestricted.

memorandum

TO FROM

SUBJECT DATE

RECOMMENDATIONS

Assuming that movement continues to be recorded, the following field investigations and surveillance measures should be undertaken:

1. The inferred thickness of fill in the potential slide mass above the reservoir level should be checked by at least 2 resistivity soundings.

2. Bench marks should be set out from stable bedrock into the slide mass and foundation area of the house so that periodic leveling will detect any vertical movement.

3. As the reservoir level is lowered, the face of the slope should be inspected for signs of potential instability, particularly since the drawdown condition is most critical to slope stability.

4. Other areas of the reservoir periphery are known to contain both active and potential landslide masses, particularly on the southern arm of the lake. When the reservoir is lowered, these

memorandum

TO FROM

SUBJECT DATE

should be inspected. During the coming fiscal year we should budget funds for field mapping these areas, delimiting the active slides, and recommending surveillance or remedial measures.

The scope of remedial work will partly depend on the thickness and extent of the potential slide mass, as determined by the field investigations outlined above. At the present time, the following alternatives should be considered:

1. If the slide proves to be confined to the shallow fill above the present reservoir level, then perhaps horizontal drain-collector pipes could be installed which would effectively "bleed" off the hydrostatic pressure and prevent further sliding.

2. If the slide proves to be more deeply seated, perhaps in the older alluvium at 40 to 50 ft. depth, then unloading the top of the slide mass by removing the house plus the fill down to the level of the boat ramp access road would be the first step to take in preventing further sliding.

santa clara county

FLOOD CONTROL AND WATER DISTRICT

DONALD K. CURRLIN GENERAL MANAGER

516 EAST MARTHA STREET
SAN JOSE, CALIF. 95112
DEPARTMENT OF ADMINISTRATION AND FINANCE 299-2031
CLERK OF THE BOARD 299-2031
ENGINEERING DEPT. 299-3841
PUBLIC SERVICE DEPT. 299-3841

March 27, 1969

Mr. Clifford Cortwright
Division Engineer
Division of Safety of Dams
Department of Water Resources
P. O. Box 388
Sacramento, California

Dear Mr. Cortwright:

Enclosed for your information is a copy of a memorandum by our staff Engineering Geologist reporting on a potential slide at Anderson Reservoir. A crack in a bench upstream of the south abutment of the dam was observed by our Resident Caretaker on 28 February 1969. Upon notification, the site was immediately visited and inspection revealed no likelihood of danger to the dam structure. However, a large slide could have an adverse effect on the intake structure for the outlet works through the dam or could cause wave action in the reservoir if it occurred suddenly.

Measurements were taken of the width of the crack and a surveillance program was established to assess the magnitude of the problem. A well in the vicinity of the potential slide area was uncapped and allowed to flow free in order to help reduce the water pressure in the soil mass. The Caretaker was evacuated from the house on the bench even though it appeared that the mass was slowly stabilizing.

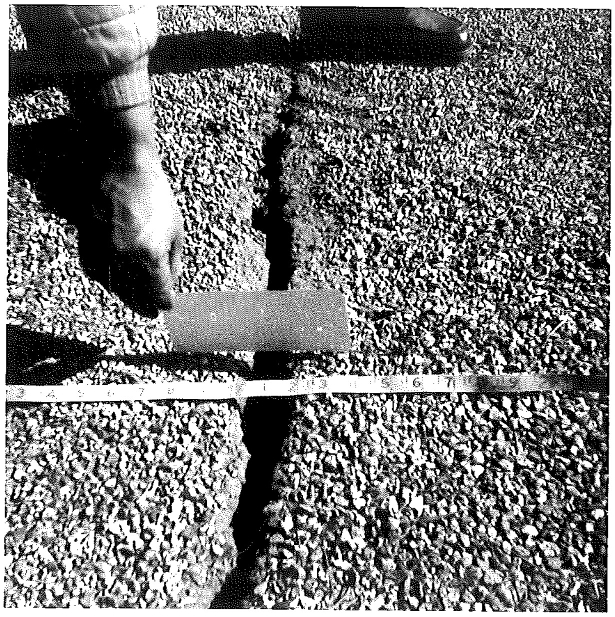
As indicated by the enclosed memorandum, the movement of the soil mass has apparently stopped. Nevertheless, we are having the house moved off the bench and will excavate a considerable portion of the potential slide mass in an attempt to releave the load and stabilize the slope. After the excavation has been completed, we will review the situation to see if further stabilization measures may be desirable.

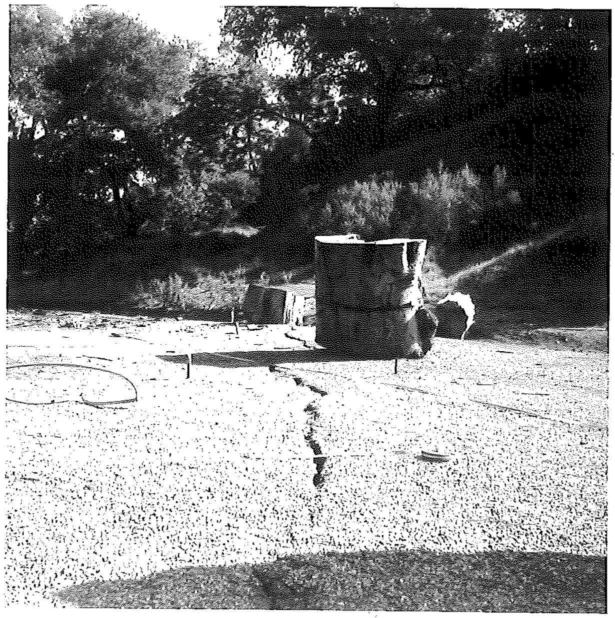
We will notify you of any further action and results obtained in this matter.

Sincerely yours,

Lloyd C. Fowler
Director of Engineering

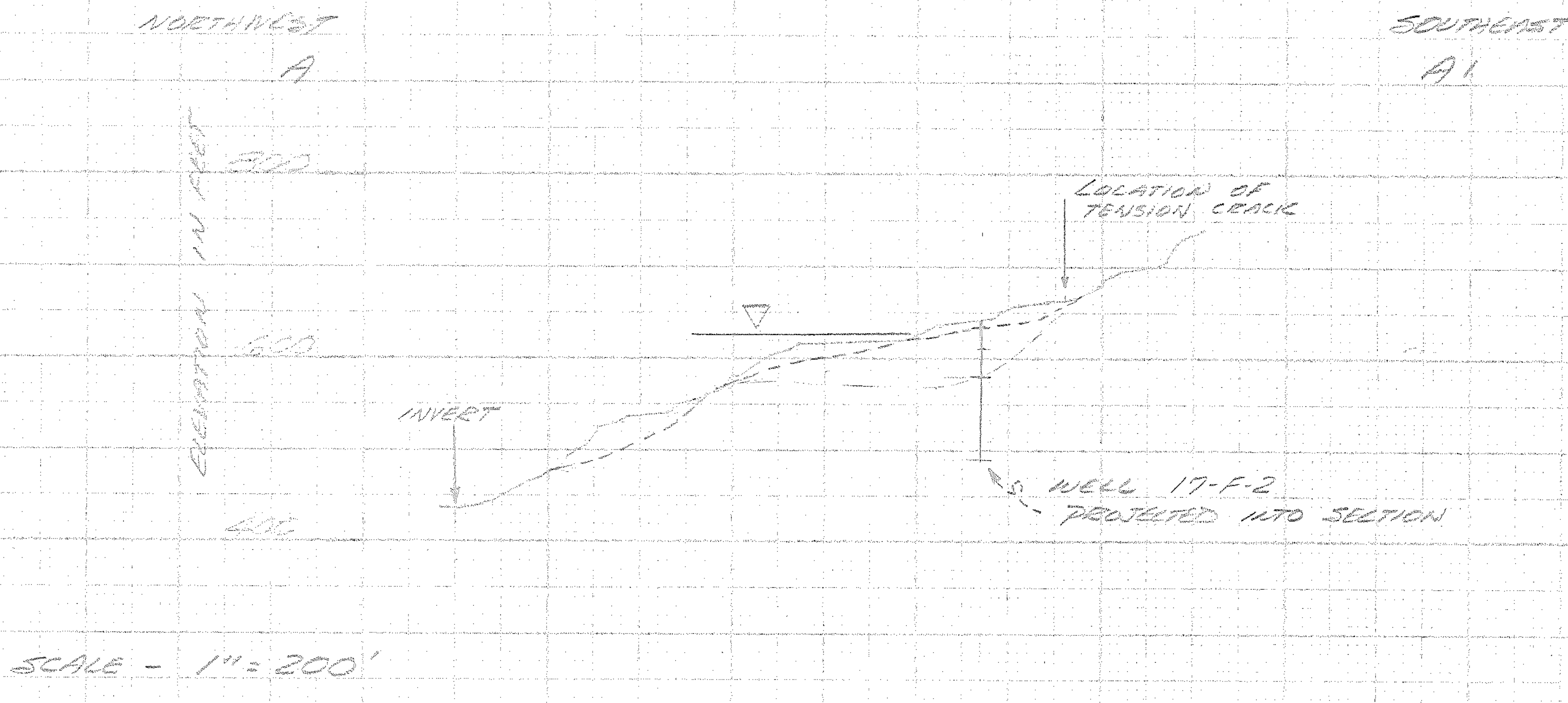
Enclosures





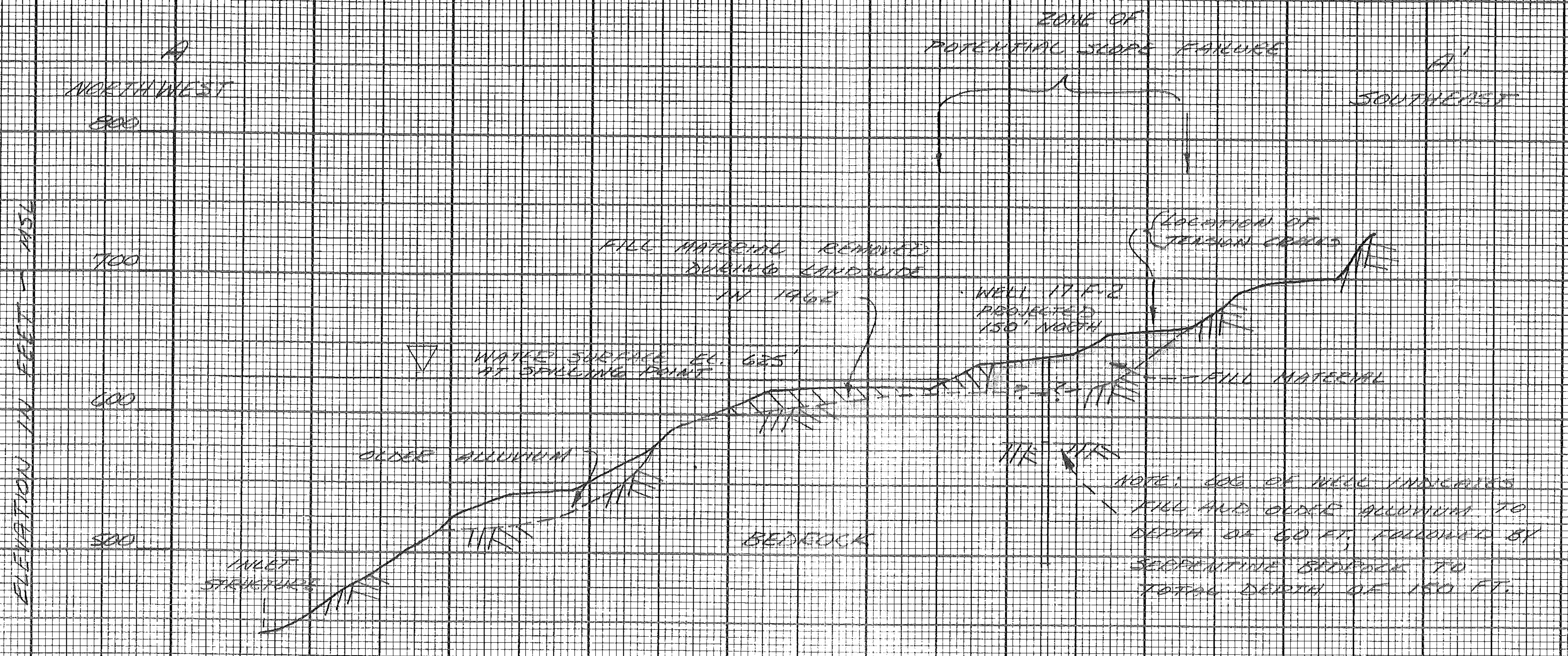
TENSION CRACKS AT POTENTIAL SLOPE FAILURE
ANDERSON RESERVOIR (LOOKING NORTHEAST)
3-19-69

PLATE 4



GEOLOGIC CROSS-SECTION IN VICINITY
OF POTENTIAL SLOPE FAILURE
ANDERSON RESERVOIR

CLEARPRINT PAPER CO. NO. C48. 20 DIVISIONS PER INCH BOTH WAYS. 300 BY 200 DIVISIONS. CLEARPRINT CHARTS PRINTED IN U.S.A. ON CLEARPRINT TECHNICAL PAPER NO. 1015


ZONE OF
POTENTIAL SLOPE FAILURE
A
NORTHWEST
A'
SOUTHEAST
ELEVATION IN FEET - MSL
800
700
600
500
400
FILL MATERIAL REMOVED DURING LANDSLIDE IN 1962
WELL 17-F-2 PROJECTED 150' NORTH
LOCATION OF TENSION CRACKS
WATER SURFACE EL. 625' AT SPILLING POINT
FILL MATERIAL
OLDER ALLUVIUM
BEDROCK
INLET STRUCTURE
?
?
NOTE: LOG OF WELL INDICATES FILL AND OLDER ALLUVIUM TO DEPTH OF 60 FT, FOLLOWED BY SERPENTINE BEDROCK TO TOTAL DEPTH OF 150 FT.

SCALE: 1" = 100' HORIZ. & VERT.

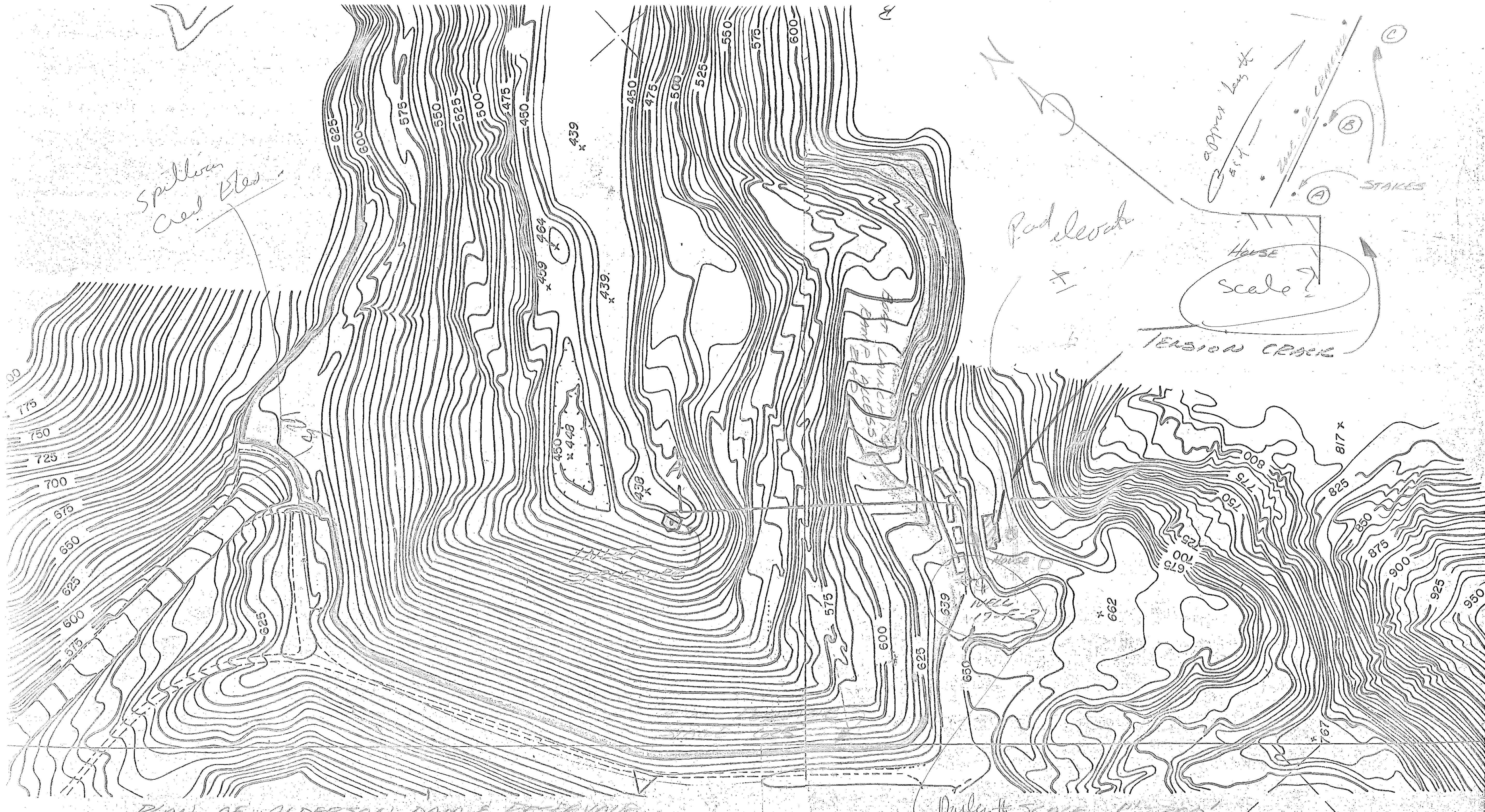
NOTES:

1. FOR LOCATION OF CROSS-SECTION, SEE PLATE 1.
2. GROUND PROFILE FROM TOPOGRAPHIC BASE DATED JUNE, 1961
3. THICKNESS OF FILL MATERIAL BASED IN PART ON RESISTIVITY SOUNDINGS MADE MARCH 19, 1969
4. WATER SURFACE ELEVATION ABOUT 2 FT. OVER SPILLING POINT (EL. 625) FROM 2/24 to 3/3.

GEOLOGIC CROSS-SECTION
POTENTIAL SLOPE FAILURE
ANDERSON RESERVOIR

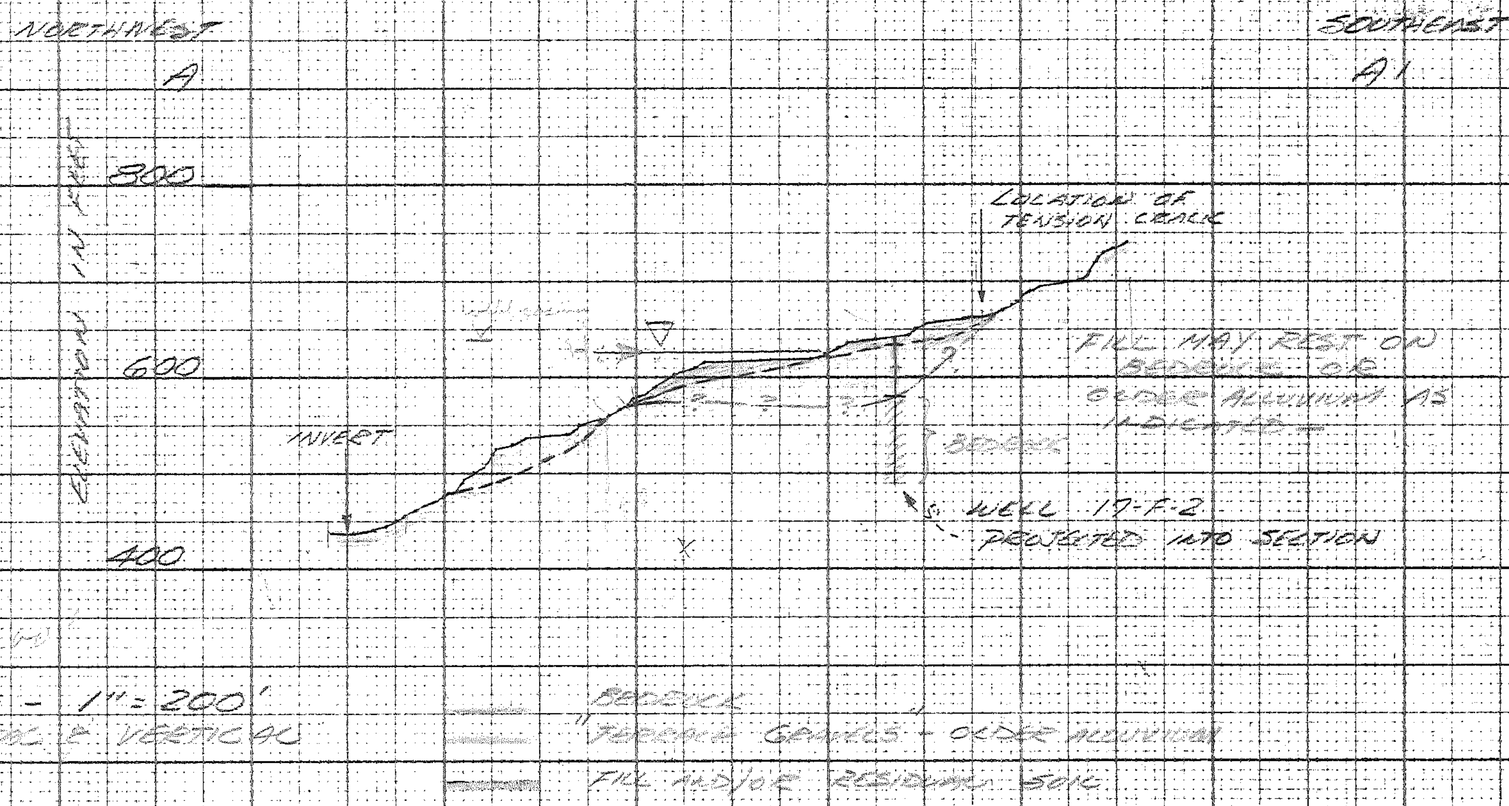
JCW 3-18-69

PLATE 3



PLAN OF ANDERSON DAM & RESERVOIR
SHOWING POTENTIAL SLIDE AREA

Dulenth SCALE 1"=200'
BASE COMPILED - JUNE 1961


NORTHWEST
A
SOUTHEAST
A1
ELEVATION IN FEET
800
600
400
INVERT
LOCATION OF TENSION CRACK
FILL MAY REST ON BEDROCK OR OLDER ALLUVIUM AS INDICATED
?
BEDROCK
WELL 17-F-2 PROJECTED INTO SECTION
BEDROCK
TERRACE GRAVELS - OLDER ALLUVIUM
FILL AND/OR RESIDUAL SOIL

1" = 400'

SCALE - 1" = 200'
HORIZONTAL & VERTICAL

SEE PLAN OF
DAM & RESERVOIR
FOR LOCATION OF CROSS-SECTION

[illegible] 1961

GEOLOGIC CROSS-SECTION IN VICINITY
OF POTENTIAL SLOPE FAILURE
ANDERSON RESERVOIR

1. Watson
2. files

memorandum

TO	FROM
Mr. Lloyd C. Fowler	Gene Watson
SUBJECT	**DATE**
Request to Monitor Landslide Areas at Anderson Reservoir	March 15, 1972

In order to monitor the amount of movement of the more hazardous landslides at Anderson Reservoir, we would like approval to: 1) Have the Engineering Services Division set up survey monuments in the large landslide near Cochrane Bridge, and 2) Have an outside consultant install two slope indicators in the landslide above the intake structure on the left abutment.

Bert Burger has field checked the landslide area adjacent to Cochrane Bridge and has assured us that several survey monitoring points can detect surface movement greater than one tenth of a foot. A total of 70 hours was budgeted for this work (page 248 of the 1971-72 Budget Book).

OK
LCF

Shannon and Wilson, Inc., a consulting firm which specializes in this type of work has submitted a proposal to install two slope indicators adjacent to the left abutment. Their proposal calls for an installation price of $2,500 to $3,000 and semi-annual measurements of $250 each. The amount budgeted for this work is $4,000 plus $1,800 for monitoring services. We recommend that this firm be used for this work.

will go to Bd.
LCF
Does this price include the instruments or do we have to provide equip?

Attached is a purchase request for the consulting work, and an agenda description for the next Board meeting.

E Watson
Division Engineer
Water Supply Division

Attachments

EW:JV:kj

PROJECT DETAIL FORM 5	Cost Center		Program					
	SOURCE OF SUPPLY	19	PLANNING	2	Project No.	190086	S	
					W.A. No.	196186	D	248
Project Title:	ANDERSON DAM AND RESERVOIR					Coord.		510

Project Description & Explanation

To monitor the existing and potential landslides at Anderson Reservoir, establish and monitor survey net, install and monitor slope indicators, and take low level aerial photographs of reservoir area for up-to-date and subsequent photo comparisons.

consulting

(1) Soils analysis services by outside consultant - A/C 8060 $4,000

(2) Monitoring services by outside consultant - A/C 8060 $1,800

Organizational Unit	Hours	Amount
District Labor		
General Manager		
Administration & Finance		
Public Services		
Technical Services Division		
Ordinance Division		
Real Estate Division		
Clerk of the Board		
Engineering		
Planning Branch		
Basic Data Division		
Water Supply Division	400	2,944
Flood Control Division		
Control Systems Branch		
Control Systems Division		
Systems Analysis Division		
Design & Construction Branch		
Design Division		
Engineering Services Division	Surveying 70	441
Construction Liaison Division		
Design Coordination Division		
Maintenance Branch		
Maintenance Liaison Division		
Maintenance & Const Division		
Records Division		
Operations Branch		
Water Production Division		
Water Operations Division		
TOTAL	470	3,385
Applied Overhead		3,893
TOTAL	$	7,278

Account Name	Acct No	Amount
Contract Services		
Alternate Contract Services (1)	XXXX	4,000
Communications	6100	
Insurance – Other	6520	
Aerial Photos	8010	
Mapping	8070	
Publication Fees/Legal Notice	8100	
Lease-Land or Structures	8410	
Lease-Equipment	8420	
Utilities	9300	
Construction	1305	
Other Contract Services (2)	XXXX	1,800
TOTAL		5,800
Materials & Supplies		
Maintenance	7410	
Operations	7420	
Other	7430	
TOTAL		
Fixed Assets		
Equipment	1406	
Land	1200	
Title Fees	1200	
Litigation & Other	1200	
TOTAL		
Intra-District Equipment		
Class I	XXXX	219
Class II	XXXX	
Class III	XXXX	
TOTAL		219
PROJECT TOTAL	$	13,297

AGENDA WORK SHEET Prepared by Jim Vantine

AGENDA DATE: ______ DEPT. Water Supply Division AGENDA ITEM NO. ______

ZONE ______ PROJECT NO. 190086 PROJECT NAME Anderson Dam and Reservoir

SUBJECT Monitoring Landslides at Anderson Reservoir

EXPLANATION

A reconnaissance investigation was made of the landslides occurring adjacent to Anderson Reservoir during the 1970-71 Fiscal Year. As a result of the investigation it was recommended that the two most serious landslides be monitored.

One of the more serious landslides occurs on the left abutment of the dam above the intake structure. Prior movement has been noted and required remedial work and relocation of the caretaker's home. A proposal by the Shannon and Wilson Firm of Burlingame which specializes in installing scope indicators has submitted a proposal to install two slope indicat~~io~~ns to monitor the amount and depth of movement of this slide mass. Their proposal calls for an installation price of $2,500 to $3,000 and semi-annual measurements of about $250 each. The amount budgeted for this work is $4,000 plus $1,800 for the measurements.

The other landslide area recommended to be monitored occurs adjacent to Cochrane Bridge. It consists of an older large landslide mass with areas of recent movement. It is proposed that this landslide area be monitored by the Engineering Services Division by establishing a network of 4 to 5 survey points.

RECOMMENDATION

☐ Director of Engineering ______

☐ Director of Public Services ______

☐ FISCAL CLEARANCE ______ by ______ (If NO explain) ______

☐ Director of Admin. & Finance ______

☐ Attorney ______

☐ GENERAL MANAGER ______

Observations of Nov 16, 1960
Photographs of Anderson Dam

1) Buildings were in place at the left abutment area (caretakers house and 5 other buildings

2) In slide where S.I-1A is located (above end of spillway) it appears that failure may have been in part due to excavation for cut slope for boat launching ramp.

3) Scarp area appears to be in ~~the~~ the same position on road above slide as at present time. Scarp however may be deeper at present time

4) Road at about lake level Below SI-1 appears to have been removed and is in about same state as it is at present time.

5) Fill was placed at end of boat launching ramp and may have been

6.)

1.) Call Shannon & Wilson

2.) Contact Bert for survey of monument.

3.) Map slide in detail utilizing 1" = ______ feet topo.

4.) Try and get older photos between 1952 and 19__ which shows area

5.) talk to a Mr. ______ who has photos and other information of Anderson Reservoir.

July 10, 1973

Anderson Reservoir
Slope Indicator Monitoring

Bob Perry of Shannon Wilson called + inquired about the next inclinometer reading. I asked what we had sched. for in our contract. He said $1,800 which included installation, + semi-annual readings for 2 years + additional readings as required. I indicated I had not had an opportunity to review whats been done + ~~what~~ the status of the project + asked that he maintain the semi-annual shed. of measurements. (Last reading was in March 1973 + thus next read sched for @ Nov. 1973.

He would like to review our x-sections (when we get them done) + our survey data to correlate with slope indicator movement. I agreed that this is possible.

He indicated that he will call before going out to take the next readings.

Bob Perry (415) 697-7563
Shannon, Wilson, Assoc.

T. J.

5-41

Ed Imhoff, Hydrologist Mar. 19, 1962

J. Robert Roll, Chief Engineer

New Landslide at Anderson Reservoir (Inspected March 17, 18, 1962).

Location of Slide: Below the concession stand on the reservoir slope above the inlet structure, between elevations of 600 and 500 feet.

History of Movement: (Date)	(Extent of Movement)
Origin-March 7, 1962	1 inch crack at head
March 8, "	2 inch crack at head
March 9, "	3-4 inch crack at head
March 10, "	1 foot downward and outward separation at head
March 11-17,'62	6 to 7 feet total downward and outward separation at head

Size of Slide: Shape is roughly rectangular. Dimensions are about 200 feet across and 300 feet in direction of flow. Depth is unknown but is likely to exceed 50 feet from ground surface, in overlap area, to the slip surface at the base of the slide.

Composition of Slide: Fill material consisting of clay-to-cobble size particles of serpentine and altered igneous rock.

Surface Features: 1. Prominent slip-face escarpment at head and shear escarpment on left flank.

2. Slickensides on shear face on left flank indicating pressure of slide against that point.

3. Tension cracks, up to 3 feet in width and 50 feet in length--not prominent in upper half.

4. Ground water seepage at toe of slide and on left flank.

5. Pressure and flow ridges in mid-section (overlap area) and toe (deposition area).

6. Mud ooze at the head, left flank, and toe.

Damage to Structure:

1. A concrete, steel-reinforced boat ramp on the head of the slide has been highly warped and cracked. The ramp is 50 x 75 feet and consists of the beam and bay type of design. The concrete is 2 feet thick in the beams and 8 inches thick in the bays.

2. The asphalt road at the head of the boat ramp has been broken and contorted.

3. A small amusement stand & slab, a gas pump, and a storage tank, have been severely damaged.

4. Sloughing back of the slip face is threatening to damage a motor, pump, and well column.

5. If the slide continues, fill spillage into the reservoir could damage or clog the inlet structure.

S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 1 OF 2

115-41

Causes of the Slide: The rains of February-March, 1962 undoubtedly supplied extra load to the fill and lubrication to the base of the fill. In addition, a heavy boat ramp was constructed on the fill last year. The position of the boat ramp in relationship to the movement of the slide suggests that the weight of the ramp may have triggered the fill material, the shear strength of which had already been greatly lowered by ground water.

Prevention of Further Damage:

1. The heavy concrete ramp at the head of the slide should be removed as soon as possible.
2. The slide should be surveyed and stake lines should be plotted across it so that the rate and direction of movement can be determined.
3. An arc-shaped berm should be constructed around the head of the slide to keep out possible storm run-off.
4. The downward movement of the slide is being slowed by a resistant formation of flat-lying terrace gravels. Of course, these terrace gravels must not be removed. An arm of the slide is moving to the dam side of these gravels and is spilling out on a haulage road. This material should probably be removed before it overloads the fill directly above the inlet structure.
5. It may be feasible to drive some type of drainage pipe into the left flank of the slide and tap off some of the ground water.

cc: John H. Clarke, Hydrographic Engineer
Dan Kriege, Asst. " "

S. C. V. W. C. D.
MICROFILMED - JANUARY 1969
PG. 2 OF 2